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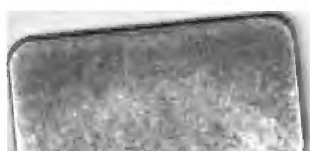
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THE PRINCIPLES AND PRACTICE
OF
BOVINE MEDICINE AND SURGERY:

WITH
ONE HUNDRED AND FIFTY-THREE ILLUSTRATIONS.

Nineteen Coloured Plates.

AND
A CHAPTER SHOWING THE INFLUENCE OF DISEASE ON
MEAT AND MILK, AND THE PRACTICAL METHODS
OF EXAMINATION.

BY
J. WOODROFFE HILL, F.R.C.V.S.,
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AUTHOR OF
"THE MANAGEMENT AND DISEASES OF THE DOG," "THE RELATIVE POSITIONS OF THE HIGHER
AND LOWER CREATION," "SURGICAL AND PATHOLOGICAL
NOTES," ETC., ETC., ETC.

"Knowledge directeth practice, and practice increaseth knowledge."



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ERRATA.

- Page 31, line 15 from bottom, for 'p. 29' read 'p. 32.'
- „ 94, line 21. The two paragraphs following 'pressure of one's thumb' should form part of the quotation from Aitken.
- „ 101, line 22, for 'prikle' read 'prickle.'
- „ 157, after description of Fig. 43 insert (Chauveau).
- „ 159, ditto, Fig. 44, ditto.
- „ 249, ditto, Figs. 51, 52, 52, ditto.
- „ 436, footnote, line 5, for 'plexed' read 'flexed.'
- „ 515, in contents of chapter insert 'Abscess.'

TO

GEORGE FLEMING, Esq., F.R.G.S., F.R.C.V.S.

PRESIDENT OF THE
ROYAL COLLEGE OF VETERINARY SURGEONS; INSPECTING VETERINARY SURGEON,
ARMY VETERINARY DEPARTMENT.

MY DEAR MR. FLEMING,

As in some measure an acknowledgment of the incalculable benefits the veterinary profession has received through your earnest and indefatigable efforts to promote its welfare, raise its standard, and, through your brilliant literary productions, elevate veterinary medicine to its proper position, it affords me sincere pleasure to be permitted to dedicate the first edition of this work to you.

Few, if any, among us can hope to win the laurels which have fallen to your share. The exceptional gifts nature has endowed you with have been bountifully displayed for the weal of your less fortunate brethren and the good of your country; and those sterling qualities and moral excellences which all who have the pleasure of your personal acquaintance must admire, will ever shine forth pre-eminent.

That your life may be prolonged to enjoy the high and honourable position you so deservedly occupy, and that you may see your noble example followed, and the many kindnesses you have shown to the weaker members of the profession you so adorn rewarded, is the earnest wish of

Yours most sincerely,

J. WOODROFFE HILL.

PREFACE.

IN resolving to make another addition to the literature of my profession, I have, amidst many doubts, been encouraged to hope that the vast importance of looking more carefully after those animals which comprise one of our country's greatest sources of wealth may be brought more prominently forward by a study of the diseases and accidents to which they are subject, and the immense losses that arise therefrom.

During an early, sound, and practical tuition, and in a subsequently extensive practice, I have been afforded exceptional opportunities for research into the majority of diseases contained in this work. My object in publishing the fruits of such research has not been to make every man his own doctor, but to produce a text-book which, while of value to the busy practitioner, may also assist the non-professional in diagnosing diseases, and in the event of inability to obtain *qualified* veterinary advice, to apply the knowledge he gathers from these pages for the prevention of suffering, death, and loss.

Empiricism has too long ridden rampant in the land, and if by giving the general reader an insight into scientific matters, an antidote will be found for the old proverb that "Quackery has no friend like gullibility," I shall, even if blamed by some, anticipate the thanks of others, and feel myself rewarded.

The "Diseases of the Ox" is a large field for the pathologist to explore.

"A painfull work it is, I'll assure you, and more than difficult,
Wherin what toyle hath been taken, as no man thinketh, so no
Man believeth, but he that hath made the triall."

ANT. A WOOD.

My task in the midst of active and daily duties has been a long and laborious one, and in the midnight oil consumed, as thought upon thought occurred, my mind was drawn to the fact that it was essential "to trust not a great weight to a slender thread." From the learning of other authors, therefore, I have culled knowledge, and quotations will be found notably from our distinguished writer, Mr. Fleming, also Professors Williams, Walley, Gamgee, Cobbold, and others whose names appear in the text. Particularly am I indebted to Dr. Cobbold, the celebrated helminthologist, for kindly placing at my disposal his able works on the "Internal Parasites of our Domesticated Animals," and "Entozoa of Man and Animals," and for revising a portion of the latter on Fluke development especially for this volume.

To my esteemed colleague, Professor Fream, my warm thanks are due for the valuable assistance he kindly gave me during the early portion of the work's passage through the press.

It has been said, "There is a remedy for everything, could we but hit upon it," and searching investigation, hard study, in fact, continuing students through life, will bring the medical man and veterinarian nearer and nearer to this much-to-be-desired goal. "Ignorance would then be no longer a voluntary misfortune," and as "Good watch prevents misfortune," so would the veterinary art rise in public estimation and maintain its worthy position. Information derived from the shrewd unprofessional observer often assists the professional attendant in arriving at a correct opinion. One more object, therefore, will have been accomplished if the following pages inspire sufficient interest to increase the vigilance of the stock-owner, and make him better acquainted with the various pathological changes which take place in disease.

J. W. H.

WOLVERHAMPTON,

September 12th, 1882.

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INTRODUCTORY CHAPTER.

HEALTH AND DISEASE.

THE subject of Health and Disease, if dealt with from a merely practical point of view, must of necessity occupy a very wide range. As forming the introductory chapter to this work, it has been found necessary to compress it into as small a compass as feasible without detracting from its general importance.

Health is usually known as that condition of the body in which every function is performed in a natural and proper manner—where each act in harmony, and from which there is no deviation. "Perfect health, like perfect beauty," says Dr. Guy, "is perhaps an ideal compounded of the perfections of many individuals; or, if it exist, it falls to the lot of few, and its phenomena have met with no accurate description."

As in human beings so in animals, a varied condition of health may be present. The terms "*perfect*," "*good*," "*strong*," "*feeble*," "*robust*," etc., applied to health, show, says the same authority, how generally this difference in degree is recognised. "But," he observes, "there are also differences in kind as well as in degree. The different races of mankind, for instance, are marked by peculiarities of health not less striking than those of form. The fact that people of the same race differ widely in this respect, is recognised in the distinction of temperaments; and that individuals differ, is shown by the existence of the term *idiosyncrasy*. These differences are readily accounted for by the great number of external

influences to which the body is exposed. A due supply of proper food, a sufficiency of pure air and water, a certain temperature, light, suitable clothing and shelter, cleanliness, exercise, temperance, and exemption from harassing cares—these and their opposites, separate or variously combined, are in constant operation to promote, impair, or modify health. These in themselves have an important influence on the condition even of those whose bodies are originally free from all defect. But such are probably few in number, compared with those who inherit from parents or ancestors defects of constitution—defects originally derived from the operation of these very causes.

“The influences to which the body is exposed in all states of society, but especially in highly civilized communities, are so various and so complicated as, even without hereditary taint, to account for the infinite variety which we observe in health, and as a natural consequence in disease; no additional argument, therefore, is necessary to establish the first great principle on which much of practice of medicine hinges—that *both in health and disease every function of the body varies in different persons within wide limits of intensity*. This fact is the key to the imperfection of medicine as a science, and its difficulty as an art.

“Though health, as has been stated, admits of no accurate description, the several functions of the body, as they are performed in persons who are termed healthy, ought to be carefully studied, the variations in their intensity noted, and their general condition ascertained. For practical purposes those functions are the most important which are most frequently examined in disease, and furnish the physician with his most useful signs.”

These remarks to a great extent are applicable to animals; the variety of breed, temperament, and conditions under which they exist, severally play their part in the manifestation of health. As the late Mr. Youatt observed, “Cattle have been too much left to the tender mercies of those who are utterly ignorant of their structure, the true nature of their diseases, the scientific treatment of them, and even the very first principles of medicine.” True, at the present day reformatory measures have taken place; but we are nevertheless constrained to admit many deficiencies still exist, and disease continues to be nursed.

Disease consists in a departure from natural conditions, and its

causation may be divided into *proximate* and *remote*. "To define disease," Dr. Guy says, "we must first have defined health, for the one is but the negation of the other.

"In like manner the description and right understanding of disease depends upon the description and right understanding of health." Dissection and careful observance teaches us the latter. *Experience* alone can give us success in combating the former. Whilst "*learning* is the handmaid of experience, and ought to be its inseparable companion."

Disease, like health, varies in its nature: thus it may be *epidemic, endemic, sporadic, contagious and infectious; hereditary, sympathetic, acute, chronic, continued, intermittent or periodical; remittent, structural, functional, common, specific, malignant*. The professional attendant must therefore be thoroughly competent to recognize these varied conditions to become a successful practitioner. It is in the careful record of cases that materials have been found on which to form the general principles and practice of medicine and surgery. And I therefore throw out this hint in opposition to the marked lack of veterinary pathological contributions in the present day as compared with those of the past.

It has been observed: "The study of medicine is prosecuted under two relations—namely, as a *science*, and as an *art*. Medicine considered as a *science* takes cognizance of all that relates to our knowledge of diseases, and especially of the circumstances under which they become developed, of the conditions of their existence, of their nature, and of their causes, in the widest sense of these terms. Considered as an *art* (in so far as medicine has that practical value), its object is to distinguish, to prevent, and to cure diseases. The object and aim of medicine as an art is to alleviate human suffering, and to lengthen out human existence, by warding off or by modifying disease, 'as the greatest of moral evils,' and by restoring health, and even at times reason itself, 'as the greatest of moral blessings.' In other words, the practical view required to be taken of medicine is, that 'it is the art of understanding the nature of diseases, so as to appreciate their causes, and to prevent their occurrence when possible, to promote their cure, or to relieve them when they occur.'—*Biglow*.

"Many branches of human knowledge are combined in the con-

stitution and elucidation of the science; and the practice of medicine as an art ought to be founded on principles of facts of universal, or at least of extensive applicability."—*Aitken*.

Such remarks apply to both man and animals; and the former, with his superior knowledge, exercises from time to time the power of that knowledge for the benefit of his own species and those of the lower world over whom God has given him control. But though men have written, and will continue to write, on the manifold diseases to which flesh is heir, yet, with all his talent, however great it may be, it has been truly observed by Chomel, "that no man possesses all the pathological knowledge contained in the records of his art." Yes, we must go back and back into the lore of our forefathers, combine the opinions of the great ones gone with those present, and with the knowledge we possess ourselves, to form anything like a trustworthy, comprehensive, scientific, and practical treatise.

Unfortunately some form of disease is ever present in this country. Perfect immunity, so far as history shows, never has been, and it may reasonably be expected never will be, known so long as cattle exist. This, though not to the agriculturist a pleasant consideration, is nevertheless one calculated to generate good, by arousing the mind from apathy and stimulating it to inquiry. For as we have the means within our reach to lessen mortality, and in many instances to altogether prevent animals contracting disease, it behoves us to keep a careful look-out for predisposing causes—when discovered, to avoid them as far as possible; and when unavoidable, to adopt means whereby they may be modified.

Mr. Fleming observes: "The knowledge we acquire of the nature of causes, gives us a means of establishing a system of preventive or prophylactic treatment, which must ever form the most valuable and important department of veterinary science."

Dr. Chambers remarks: "To know the cause of disease is sometimes to be able to cure it, often to be able to prevent it. In some cases the cause is beyond our power, but an acquaintance with its nature may teach us to remedy its consequences. There are many diseases, also, over which medicine has very little control, but the causes of which, when ascertained, may be avoided or extinguished."

But prior to looking into the cause of disease, it will be necessary

to establish a successful diagnosis. We must be well assured of its nature; for, to use the words of Dr. Parkes: "Unless diseases are completely identified, all inquiry into causes is hopeless." And he continues: "The advance of diagnosis has of late years been owing not merely to improved methods of observation, but to the more complete recognition of the great principle of the invariableness of causation. The sequence of phenomena in the diseased body proceeds with the same regularity and constancy as in astronomy or chemistry. Like causes always produce like effects."

An early diagnosis is still more valuable. By detecting the spark before it is fanned into flame we may, in some cases, be able to eradicate all that is mischievous or dangerous. True, this detection is not always an easy matter, more particularly in the early stages of disease; and this fact should stimulate the veterinary surgeon to continuous study, to the exercise of all his faculties, for the purpose of smoothing the road to a successful diagnosis. Every little helps, and if each professional man would add only a mite of knowledge to the general fund, a sounder basis of treatment might be established and a firmer standpoint arrived at.

Rome was not built in a day, is a proverb applicable to the discovery of remedial measures in disease. As cholera, diphtheria, rinderpest, and anthrax, have alike baffled the medical man and veterinary surgeon, so now many diseases are still hidden in mystery; their origin is a problem we cannot solve, and their treatment is therefore unsatisfactory and difficult. Great as the progress of our science has been, much, very much, remains to be done. Nevertheless, baffled as we are from time to time, we struggle on, finding new courage at each step by the gradual experience we gain, an experience which in right hands may always be turned to good account.

Veterinary sanitary science has burst upon us like a sunbeam, and chased many a dark cloud away; as in the sister profession, so in my own, this has now become an advanced study. The vast importance of this connecting link between health and disease cannot be lost sight of. Mr. Fleming's prolific and able pen had given to the world a splendid effort on this subject.* The amount of disease due to sanitary neglect has been, and still is, immense. A defective drain, an ill-ventilated cow-house, a damp or exposed

* "Veterinary Sanitary Science and Police."

sheep-fold, a badly-constructed stable, are often the unsuspected roots of many fatal maladies. Prescribed medicines are given, and advertised cure-all drug-chests are ransacked to remove the effect, while the cause is allowed to remain undisturbed.

The old proverb, "Prevention is better than cure," still holds good. The evil influence must be avoided, the spell broken, or disease will still ride rampant.

Nature, nevertheless, is ever progressive; we may thwart her purposes, but yet her influence is exerted; changes are ever taking place, time rolls on, and age brings with it decay and its many infirmities. It is for us to render those changes as favourable as possible to the maintenance of health compatible with the circumstances.

Throughout life destruction and reproduction are continually going on, and nature's requirements are very exact. Good material is necessary, and favourable opportunity requisite for the carrying out of the processes. "Were," says Dr. Parkes, "the laws of health and of physiology better understood, how great would be the effect! Let us hope that matters of such great moment may not always be considered of less importance than the languages of extinct nations, or the unimportant facts of a dead history."

Dr. Chambers observes: "Healthy life consists in a continuous and equally balanced repetition of the two necessary parts of the renewal of the body, constructive and destructive assimilation—in other words, 'growing and moulting.' The essential nature of disease, that which makes it disease, is a deficiency of health, a deficiency of either construction or destruction in one or more points. A cure of disease, natural or artificial, consists in a new birth or renewal of the deficient life. The practitioner, to whose mind the cure should be the ever-present object, will therefore do well to classify, as far as he can, all morbid phenomena on this principle; for on this principle will be based his most successful practice.

"Life cannot make the brute materials which it uses live longer than that which it leaves unused, but it has the power of making them anew, and building them up into a certain shape for the time they are made to last. In short, life rests on the metamorphosis or renewal of the body; as this renewal is more thorough, the individual is more perfect, and fulfils better and more completely the duties of its position. If it stops altogether, the body is no longer living. If it partially stops, the order of normal phenomena is disarranged, and ease is expelled—there is a state which we call

'dis-order' or 'dis-ease.' To speak, therefore, of 'a superabundance of life,' or of an 'excess of vital action,' is a contradiction in terms. There cannot be too active a metamorphosis of the tissues, for the fresher their organic constituents, the more serviceable they are, and the longer duration they have before them. There cannot be too close an adherence to that typical form which it is the business of metamorphosis to keep up, any more than there can be too exact an obedience to law and order. The most active metamorphosis of the body possible, the highest possible development of life in every part, is health."

The complete cessation of metamorphosis is death. The partial cessation, or arrest, is disease. In death, the flesh goes on being decomposed as during life; but not being renewed, the form is lost entirely. In disease, decomposition goes on, but renewal flags, and the decomposing tissues are not sufficiently pushed out by new-formed substance. They are retained as part of the imperfect body—a sort of "death in life"—and are rightly termed by the pathologist "degenerate." They are generated, but not *re-generated*; they are generated in an inferior mould of form."

Thus our efforts should be directed to aid when necessary nature's expulsive laws, and not, as it is to be feared is too often done, thwart them. Those who have studied the wonderful mechanism of the animal frame, cannot fail to have been struck with the marvellous structure and exact proportion and given use of every part, and to realise the fact that only a Supreme Being, an All-wise Providence, could have brought into existence such a masterpiece of creation. To abuse such beneficence is no light sin; to keep in repair the structure is, to the right-minded man, a sacred and pleasing duty.

Climate, the nature of soil, purity of food and water, cleanliness, exercise, and hereditary weakness, are matters such as must be taken cognizance of by the veterinarian in the study of health and disease. Experience has shown that such important considerations will not brook neglect. Indeed, it is only by instilling such principles as these into the minds of those most interested, that we can expect reformation in this direction to continue progressing; and although it must be admitted that many improvements are still wanting, there is now, I am thankful to say, a growing interest in the welfare of stock, such as improved methods of transit, whereby their sufferings have been ameliorated and disease prevented. This

has been in great part due to the Royal Society for the Prevention of Cruelty to Animals, whose efforts on behalf of all that concerns the interests of the domestic animals have been productive of incalculable benefit, and I take this opportunity of saying this Society is deserving of every praise and of the liberal support of the nation. The system of inspection, though still in some districts insufficient, is now more rigid, and by this means the interests of cattle-owners are better protected and their confidence is strengthened in the powers that be. For it is by jealously guarding the dangers to which one of their chief sources of wealth is exposed, that we reap individually the benefits which follow. To use Mr. Fleming's words: "Trade and intercourse are necessary for the welfare of the human family, and man cannot exist without the assistance of certain animals, whose multiplication or improvement constitutes an essential feature of civilisation. The dangers to which these animals are exposed—and through them the well-being of mankind—can only be averted by an exact comprehension of the diseases to which they are liable, or an acquaintance with the various influences which operate to induce, maintain, and propagate these diseases, and the establishment of a system of sanitary police, efficiently organised, and provided with preventive measures based on their knowledge."

It is to the comprehension of these diseases, and the influences which are brought to bear in their production, that my labours will be directed.

Throughout the following pages my object will be to render the work valuable as a text-book alike to the professional and non-professional reader. Yet without any desire to make every man his own cattle-doctor, I shall endeavour to write it sufficiently plainly that all classes may comprehend it, rather risking thereby the censure of some members of my profession than encouraging the employment of charlatans and impostors, and applying the language of Dr. Carpenter: "That in proportion as the treatment of diseases shall be thus withdrawn from the domain of empiricism, and be founded on scientific principles, in that proportion will the medical profession acquire that dignified confidence in itself which shall keep it *steady* to its high and noble aims, and will attain that general estimation which will be freely accorded to its enlightened and disinterested pursuit of them."

CHAPTER II.

DISEASES OF THE RESPIRATORY ORGANS.

Catarrh. — Influenza. — Laryngitis. — Malignant Laryngitis (Edema-Glottidis). — Bronchitis. — Pleurisy. — Pneumonia. — Pleuro-Pneumonia (Sporadic). — Pleuro-Pneumonia (Contagious). — Consumption. — Hoose — Polypus. — Ozæna.

CATARRH.

CATARRH is a very common affection among cattle. It consists of a febrile or inflammatory condition of the mucous membranes. It is usually confined to the eyes and nostrils, and is looked upon as simply a cold in the head, hence the term *Coryza*, from *κῶρα*, the head; and *ζέω*, to boil, signifying a fevered condition. Its extension to the mucous membranes of the bronchial tubes gives rise to what is known as bronchitis.

Catarrh has been erroneously connected by some writers with "hoose." The latter arises from an entirely different cause, and differs materially in character. (See "Hoose.")

Catarrh is more particularly prevalent in spring and autumn, and young animals appear more susceptible of it than aged ones.

Causes.—The usual causes of this malady are damp, cold checked perspiration, and contagion.

Symptoms.—Catarrh generally commences with tremors, an arched back, flinching on spinal pressure, a dry nose, and variable temperature of the horns and ears—more frequently being hot at the roots; the pulse is accelerated, and the breathing quickened; there is increased mucous secretion from the affected membranes; the eyes are first watery, and ultimately become clogged in the corners with yellow mucus; the eyelids have a puffy or swollen appearance, and the nose is dry and the margin of the nostrils dirty; their inner aspect is redder than usual, and mucus is soon

abundantly discharged. The animal frequently sneezes, and occasionally coughs; is more or less languid and disinclined to move or eat; and if in milk, the secretion is diminished. As the disease proceeds, the symptoms increase in severity, the mucus becomes thicker and yellower, and ultimately of a muco-purulent character; the respiration is considerably impeded, incrustation is observed round the margin of the nostrils, the tremors are continued, the pulse becomes small and quick, the urine high-coloured, the faeces stiff and coated with slime; the invalid rapidly loses flesh, and the secretion of milk is considerably, and sometimes totally, suspended, while the appetite is small and variable.

Treatment.—Catarrh is a disease in which good nursing is plainly indicated; the old system of bleeding, purging, and sedatives has now given place to a more rational system of treatment, which is carried out by equalising the temperature of the body by means of rugs and warm housing, with proper ventilation; and in the medical part by the administration of diffusible stimulants, combined with small quantities of linseed oil. One ounce of spts. æther. nit., and 6 ounces of the latter given once or twice daily; or the arom. spts. of ammon. in 1 ounce doses, may be administered in a pint of linseed-tea or gruel. Though it is usually the practice to commence with a draught of salts, aperients are seldom called for, and when necessary, they should be combined with ginger or some other carminative.

Diet.—This should consist of warm slops, as mashies, gruel, linseed-tea, and boiled roots.

INFLUENZA.

Influenza, or epidemic catarrh, is commonly prevalent about spring or autumn; it is similar in character to the previous disease, but is attended with greater prostration, and is more highly contagious. It attacks both young and old stock, but is more easily communicated to the former than the latter.

The direct cause of influenza is unknown; it was supposed by the Italians to be due to some stellar influence, hence the term *influenza*, signifying influence. It is now generally believed to arise from a peculiar condition of the atmosphere, but in what that

condition consists is still a mystery. Spring and autumn being the seasons in which it is most frequently seen, this tends to prove that if cold and damp do not actually produce influenza, they may be certainly looked upon as predisposing agents.

Symptoms.—The primary indications of influenza usually seen in cattle are extreme lassitude, speedily followed by loss of appetite, shivering, drooping head, dry muzzle, redness of the eyes, deflux of tears, increased and thickened breathing, and disinclination to move. In some instances sore-throat, cough, and muco-purulent discharge from the nostrils almost immediately follow the first signs of lassitude. As the disease proceeds the pulse becomes weak, the breathing hurried, the temperature high, the skin hot, the faeces dry, and coated with mucus, and offensive; the urine scanty and dark, and frequently there is a dropsical condition of the limbs. In severe types, that are allowed to run on unchecked, pleurisy and effusion in the chest become associated with it, the breath becomes foetid, an offensive, dark discharge takes place from the nostrils, the animal rapidly loses flesh, the skin clings to the skeleton, while a tottering gait bespeaks the feebleness of the poor sufferer, and the near approach to death.

Treatment.—As in the previous disease, the powerful and injudicious measures of old, which sealed the fate of thousands of cattle, have been superseded. There is no animal disease so little able to withstand depletive measures as influenza. Bodily warmth, proper ventilation, and diffusible stimulants are first indicated.

Spts. Æth. Nit.	} aa 1 ounce.
Spts. Ammon. Arom.	
Tinct. Zingib.	‡ ounce.

May be given twice a day in a pint or two of gruel or linseed-tea.

In advanced cases, and where debility exists, sulphate of iron, 1 to 4 drachms, should be given in a pint of old ale twice or three times daily, or tinct. ferri sesquichlor. ‡ ounce to 2 ounces, with a wine-glassful or two of brandy or wine in half-a-pint of linseed-tea, at the same intervals. Steaming the head will be attended with benefit, and chest-complication must be treated with counter-irritation, as mustard-blisters, or setons; the first-named repeated is preferable in this lowering disease. When the limbs are swollen, and

there is general dropsical effusion, the iodide of iron and potassium, of each 1 to 3 drachms, as per age, should be given in a little water twice a day, in addition to stimulants.

Good nursing, perfect rest, a liberal supply of nourishing food, cleanliness, and disinfection, are matters which must be always studied throughout the case. If the patient will not eat, some well-boiled gruel of lentil-meal or oatmeal, and linseed-tea mixed with grated carrots, or the latter boiled and mashed (though I prefer the former), should be administered with bottle or horn frequently during the day, and once during the night; the latter neglect is a frequent cause of the rapid changes noticed in debilitating diseases.

LARYNGITIS.

Laryngitis, or inflammation of the mucous membrane lining the larynx, is a disease not unfrequently met with in cattle. I have seen it in both young and old stock.

Laryngitis may be acute or chronic.

Acute Laryngitis. Causes.—Cold, injury externally or internally, adjacent disease. (See "Scrofula.")

Symptoms.—Respiration increased, loud and laborious; dilatation of the nostrils, and inflated cheeks; enlargement on either side of the throat, and pain on pressure. The head is stretched out, there is difficulty in swallowing, and disinclination to eat on account of the pain caused in returning the food for remastication; a short, hoarse, and gasping cough is attendant, and frequently a frothy discharge from the nostrils. There is more or less constitutional disturbance, manifested by an accelerated pulse, at first bounding and full, and afterwards small and wiry; injected mucous membranes, an increase of temperature, and suspension of functions.

Treatment.—Warm fomentations, steaming the throat by inhalation, and the local abstraction of blood, should be the first measures adopted. As soon as practicable, a mild aperient should be administered; but great care must be exercised in drenching the animal, as a fit of coughing, which the elevation of the head alone will often produce, may take place during the act, and give entrance to the inflamed larynx of a portion of the medicine, which will considerably aggravate the disease, if not suffocate the animal. In a

case of threatened suffocation tracheotomy should be performed without delay. When the acute symptoms have abated, the throat may be advantageously dressed with turpentine embrocation, mustard, or iodine ointment.

The diet should be such as the patient can easily swallow, and which will not need rumination. Warm, sloppy mash, boiled oatmeal-gruel, linseed-tea, and the like, are the most suitable agents.

An animal affected with acute laryngitis should always be under cover.

Chronic laryngitis consists in thickening of the mucous membrane of the larynx, with sometimes subacute inflammation of it. It may be a sequel of the former, or from repeated injury, or pressure. I have met with instances in stall-fed cattle attributable to no other cause than the tie-chain. In these cases the larynx has been an immense size and considerably thickened. The breathing is excessively loud, but usually not distressing.

Treatment.—Strong counter-irritation is here called for. After clipping the hair off, the following ointment should be well rubbed in:

Hydrarg. Binioidid	1 part.
Lard	6 parts.

This may be repeated when the scurf has come off, or a seton may be inserted on either side of the larynx. Internally the iodide of potassium is administered with advantage. The animal should not be tied up.

MALIGNANT LARYNGITIS (ŒDEMA GLOTTIDIS).

A specific form of laryngitis, involving the pharynx, and known as anthracoid angina, œdema glottidis, or malignant sore throat, is met with in the ox. Mr. Percival says:

"My attention was first drawn to this sad and fatal disease, through the *Veterinarian*, by Mr. Thomas Proctor, V.S., Solihull, who kindly, in October, 1850, sent me an extremely interesting account of it, from which I am about to take the remarks here offered to the notice of my reader:

"Cattle as well as horses are subject to it, and in Mr. Proctor's practice, although "scores of cases" have presented themselves, they have all of them proved fatal.

"The symptoms differ from those of ordinary or catarrhal sore-throat, in the disease being sudden in its attack, and rapidly running its course, the patient rarely surviving the third day, the entire system from the first sympathising, as is shown by the rapidity (100 per minute) of the pulse, and the general strength of the body failing. At first the salivary glands take to swell, and are extremely painful to the touch. Then the throat generally commences swelling, and becomes sore; so much so, as the tumefaction increases, as to make it so painful to swallow that food and liquids too are refused by the animal. At length the throat becomes prodigiously swollen, and difficulty of respiration, with sonorous and distressing breathing, ensues, accompanied with fetor, which, as the complaint advances, turns in some cases so obnoxious, that before death it is stinking in the extreme. The membrane of the nose is of a dark crimson colour. The countenance turns doleful and sharp, and even haggard, and, with increase of all his anxiety and distress, the poor animal dies a victim to a disease which we appear to have no power even to arrest, much less to cure.

"The appearances after death are—larynx and pharynx in a state of inflammation, ulcerated perhaps as well, and covered with putrid discharges; root of the tongue ulcerated; considerable enlargement of the salivary glands, and of the surrounding tissues also. Sometimes inflammation and effusion are likewise discoverable at the base of the brain.

"The disease is contagious, at least the following facts, which Mr. Proctor received from "good authority," would lead us to believe so: "Two stirks were found dead in a field, or nearly so, with affections of their throats. The butcher was sent for to dress their carcases. His own horse partook of some grains mixed with some of the blood taken from the beasts, and in less than twenty-four hours afterwards he died from swelling of the throat, producing suffocation. A sow and nine pigs ate of the blood and grains, and were soon afterwards seized with throat affection, with sonorous breathing, of which some of them died. The others, after much trouble, eventually recovered." "

BRONCHITIS.

Bronchitis, or inflammation of the mucous membrane lining the bronchial tubes, is seldom a pure disease, being usually associated with catarrh, pneumonia, or pleuro-pneumonia. Young stock are most liable to it. Looking at the multiplied subdivision of the bronchial tubes and their minute ramifications (Fig. 1), it will hardly be a matter of surprise that this disease as it progresses should be attended with fatal results.



Fig. 1.—1, the windpipe; 2, the third bronchus; 3, the two principal bronchi; 4, 4, the ramification of the bronchial tubes throughout the lung.—*Simonds*.

Causes.—Extension of adjacent inflammation of the mucous membrane, alternations of temperature from hot to cold and *vice versa*, damp, foul air, irritating vapours, etc.

Symptoms.—Bronchitis is usually preceded by a short, tight cough, accompanied by increased respiration, with more or less febrile disturbance. As the disease progresses the feverish symptoms increase, the nose is dry, the heat of the skin increased, the breathing wheezing, more difficult, and accompanied by a mucous r le. The cough is frequent and painful, and is suppressed by the sufferer as much as possible; movement aggravates it and causes distress. At first a limpid discharge issues from the nostrils, and this subsequently becomes thick and more copious, and ultimately muco-purulent. The eyes are inflamed, the pulse considerably accelerated, and unless speedily relieved suffocation terminates the case. The animal loses all appetite, and the emaciation is rapid during the progress of the disease. The skin is hide-bound, the coat harsh and staring, and the belly drawn up.

Treatment.—After the foregoing remarks it is hardly necessary to state that prompt measures are usually required; but the nature of these must depend on the degree of inflammation and the strength and constitution of the patient, and also on the fact whether the disease is purely bronchial, or associated with complications.

In the primary stage, unassociated with other affections, comfortable housing, equalising the temperature of the body, causing the animal to inhale hot steam, the application of mustard to the throat, and down the course of the trachea, with the following medicine twice or three times a day, will generally be attended with beneficial results:

Spts. Eth. Nit.)	aa 1 ounce.
Spts. Ammon. Arom.)	
Ol Lini. ...		6 ounces.

A third for a calf from one to three months old—two-thirds, six to nine months—in a little thin gruel.

Warm demulcent drinks should be allowed. Milk is best adapted for calves; gruel, linseed tea, and barley-water, for more matured animals. The bowels, if necessary, may be relieved with salad or linseed oil, and enemas. Drastic purgatives should on no account be used.

When bronchitis occurs secondarily, more powerful measures are required. A repetition of the mustard is called for, or otherwise the application of strong embrocation, or a blister. Stimulants

should be given freely and frequently. Brandy or whisky from 1 to 6 ounces, according to the age of the patient, in warm water, every three hours. To subdue the irritant symptoms camphor, from 1 to 4 drachms, made into an emulsion with eggs dissolved in milk or added to the stimulants, will be found useful; or chlorodyne, 1 to 2 drachms in a little linseed oil. The steam to be inhaled may also be rendered soothing by scalding some poppy-heads with bran. When the acute symptoms have subsided, the diet must be of a more solid character. Tonics are also to be administered, the preparations of bark and iron giving great benefit. Exposure to cold and damp must be avoided for some time after recovery.

PLEURISY.

Inflammation of the pleural membranes as a distinct affection is not frequently met with in cattle, being usually associated with pneumonia.

Causes.—The causes operating to produce pleurisy are much the same as those giving rise to bronchitis or pneumonia, viz.—exposure to cold and wet, sudden changes of temperature, and warm housing after long encountering outdoor elements. External injuries, as contusions on the chest, or penetrating wounds which frequently occur from the horns of another beast, are also often followed by pleurisy.

Symptoms.—These generally commence with shiverings which are almost continual, and according to Youatt, particularly observable in the shoulders. This he describes as “a very peculiar symptom, and should be carefully studied. Even while the animal is otherwise quiet, the shoulders and upper part of the chest are trembling violently.”

The cough in pleurisy is short, catching, and painful; the breath is taken in short jerking inspirations, and emitted in long expirations; there is great tenderness over the ribs, the animal shrinking from touch. The mucous membranes are injected, and the pulse is wiry and rapid; considerable fever is present, as manifested by the temperature, which usually reaches 104° to 105° ; whilst the muzzle is dry and hot, the mouth shiny, and the secretions scant. As the

malady proceeds, all the symptoms described increase in severity ; the breathing becomes more laboured and abdominal, the fore-legs are wide apart and the elbows turned out, the animal frequently grunts, the cough is hacking and more painful, and as effusion (hydrothorax) into the chest results from the prolonged inflammatory action, the respiratory murmur becomes so far obscured, and percussion over the region of fluid gives a dull response. As the latter increases in volume, the breathing becomes shorter and more difficult, the cheeks are inflated, the mouth retracted at the angles, and finally the animal staggers, falls, and dies suffocated.

A post-mortem examination usually reveals, in addition to the thoracic effusion, extensive pleuritic adhesions with considerable thickening of the pleura, and long bands or webs of lymph stretching across.

Terminations.—Resolution, adhesion, effusion, on chronic disease.

Treatment.—Pleurisy, from the acuteness of its character and rapidity of its progress, demands prompt and active measures : bleeding, advocated by other authors, is not, in my opinion, admissible, or in accordance with the character of the disease, which is excessively lowering in itself, and lessening the volume of blood would have a tendency rather to promote what of all things we should wish to avoid—effusion—than check the inflammatory process and prevent its occurrence. Purgatives are equally inadmissible, and, of the two, more dangerous, for if excessive action of the bowels is excited in any inflammatory chest affection, it is with the utmost difficulty it can be checked ; more often is the case, of which I have had painful experience, that its abatement has not been accomplished, and death has been hastened thereby.

The remedial measures best adapted to this disease are diffusible stimulants and counter-irritation.

Spts. Ether. Nit.....1 to 2 ounces.

Spts. Ammon. Arom.1 to 2 ounces.

Camphor powdered.....1 to 2 drachms.

Given in a pint of linseed-tea every four hours. Counter-irritation may be applied to the chest in the form of mustard and vinegar plasters, and ammonia, or terebinth liniment.

The following is an excellent and active formula :

Croton Oil	2 drachms.
Ammonia Fort.	4 drachms.
Terebinth Spts.	1 ounce.
Rape Oil	4 ounces.
Soap Liniment	4 ounces.

The temperature of the body should be equalised as much as possible, with due regard to the maintenance of proper ventilation. The cough may be relieved by the chlorodyne mixture prescribed in bronchitis. Where the debility rapidly increases, and there is danger of effusion taking place, from 2 to 4 drachms of tinct. ferri should be added to each dose of the stimulant. This, from its constringent power, is undoubtedly one of the best agents we have for counteracting dropsies. When effusion has taken place, the ferri iodidum should be substituted, the activity of counter-irritation increased, and a seton inserted in the dewlap. It is necessary, however, to observe that where the latter measure is adopted, increased support is needful, from the weakening tendency of the agent. Where the effusion increases, and the case appears hopeless unless the fluid is removed, tapping the chest by means of the insertion of a trochar between the eighth and ninth ribs may be had recourse to. The operation affords immediate relief in removing the compression on the lungs and the displacement of the heart. It is, however, as a rule, but a temporary respite. Secondary secretion follows, and usually more rapidly than that which preceded it, and we may tap again with the same result. Nevertheless there are exceptional cases, and therefore in extreme ones the operation should be resorted to.

PNEUMONIA.

Pneumonia, or inflammation of the substance of the lungs, is, comparatively speaking, not a frequent disease in cattle. Working-oxen, or those that travel long distances, are said to be more liable to it than ordinary cattle.

Inflammation of the lungs is at all times of serious import; organs so delicate in structure, vital in character, and excessively

liable to recurrent and permanent disease, cannot afford to suffer the least affection.

Dr. Chambers observes: "A consolidated or even congested piece of pulmonary tissue is absolutely powerless to fulfil its duties, and yet that those duties should be fulfilled is essential to animal life. It is easy, therefore, to understand that the gravity of pneumonia is in direct proportion to the quantity of lung involved. The degree or form of the inflammation, or condensation, is of much less weight, so far as immediate danger is concerned, than the extent of tissue over which it is spread."

Predisposing Causes.—Hereditary disease, as scrofula or phthisis; an anæmic or plethoric habit of body; extension of bronchitis; sudden and frequent changes of temperature.

Exciting Causes.—Exposure to damp and cold, violent exertion, irritating inhalations, penetrating lung wounds.

Symptoms.—The stages of pneumonia are usually three: 1st. That of engorgement, or congestion; 2nd. Red hepatization; 3rd. Yellow or grey hepatization, or purulent infiltration.

The early stage is generally ushered in with rigors, followed by fever. The temperature is increased, the pulse accelerated, at first bounding; the respiration becomes quickened; there is an occasional short, suppressed cough; the head is extended, the eyes red, the muzzle dry and hot, the tongue frequently protruded and slimy, the coat staring, the skin dry, harsh, and hide-bound. The bowels are frequently constipated, and the urine scanty and high-coloured. The animal is stiff, and stands with the fore-legs wider apart than usual.

Auscultation reveals a crackling or crepitating sound, which is circumscribed according to the amount of lung involved. This sound obscures to a great extent the respiratory murmur in those portions not diseased, and as the malady proceeds this murmur becomes nearly altogether obliterated, the crepitus general and more defined, and the other symptoms all increased in severity.

If the malady is not checked at this stage, it quickly passes on into the second. The crepitus on auscultation is absent, and no sound, except it be a slight wheezing or whistling noise, can be detected; hepatization has then taken place, and inflation is only accomplished in a very small degree. The sound emitted on percussion at this stage is very characteristic of consolidation, being flat and dead.

The cough is now frequent, painful, and accompanied with red or rusty expectoration; the eyes have a sunken appearance; respiration is performed with extreme difficulty; the cheeks are inflated in the act, the nostrils dilated, and the general expression haggard and indicative of suffering. The animal still stands with the fore-legs wide apart to allow more room for the abdominal muscles to aid respiration. Or very frequently in such cases the patient assumes a recumbent position, lying on the sternum for the same purpose. The pulse at this period has become small and wiry, the head is hung nearly to the ground, the eyes are more bloodshot, and the extremities alternately hot and cold. All the secretions are more or less suspended, particularly the milk in cows.

When the third stage arrives, and suppuration commences—in other words, when the lung-structure breaks down, auscultation discovers a new sound—a bubbling or gurgling crepitation caused by the passage of air through pus.

On placing the hand flat upon the side, much the same sensation will be communicated—it is as though fluid were boiling underneath; and I have been painfully struck with this phenomenon, both in the human and animal subject.

The cough is now loose, and accompanied with copious expectoration; the mouth and lips are coated with sticky sline; the breath has a peculiar fetid cadaverous odour, and is taken in short gasps; the horns, ears, and extremities are cold and clammy; the pulse is imperceptible. The respiration becomes shorter and weaker, the extremities and surface of the body colder, the animal staggers and falls, and death closes the scene. Such, briefly, may be described as the leading symptoms in the several stages of bovine pneumonia.

Treatment.—Pneumonia admits of no delay in treatment; immediately symptoms of the malady are presented, our course must be promptly decided. The remarks already made as to unadvisability of bleeding in respiratory diseases are equally applicable here. Stimulants and counter-irritation are decidedly indicated. The former may consist of half-a-pint of brandy or whisky in a quart of gruel twice or three times a day, or

Spts. *Æther. Nit.*..... 1 to 2 ounces,

Spts. *Ammon. Arom.*..... 1 ounce,

with the same directions. Counter-irritation is effected by strong

mustard-plasters, or turpentine and ammonia liniment. In protracted pneumonia this may be carried to the extent of a cantharidine application, and the seton is especially serviceable. The necessity of bodily warmth, the admittance of a reasonable amount of fresh air and a nutritious diet, must not be forgotten. The sulphate of iron, from $\frac{1}{2}$ to 1 ounce in a quart of sound ale, after the more active symptoms have abated, will materially assist in promoting convalescence. As in all bronchial or chest affections, great care should be exercised in administering drenches. A portion passing down the trachea during inflammatory action is often attended with fatal consequences.

It is now pretty generally acknowledged that consolidated lung is capable of regeneration, and I have myself had practical experience of the fact. Dr. Chambers observes: "I have no doubt, in my own mind, that the way in which consolidated lung recovers is by the exudated fibrine breaking down into pus, and being expectorated, whilst the obstructed air-vesicles regain their elasticity and capacity for performing their functions. This is a strong argument for ample supply of nutriment during the regenerative process."

After convalescence has been established, it will be necessary for some time to guard against cold and exposure.

PLEURO-PNEUMONIA (SPORADIC).

Apart from that form of pleuro-pneumonia known as *contagious*, or epizootic, cattle are subject to what is termed simple or sporadic pleuro-pneumonia, a disease common to all animals, non-contagious, sudden in its attack, rapid in its progress, and having no incubative stage for the anatomical and pathological differences. (See "*Contagious*," p. 23).

Symptoms.—These may be briefly described as follows: rigors increased respiration, loud murmurs and crepitus, cough, spinal shivering, nasal and lachrymal discharge, injected visible mucous membranes, suspension of rumination and lacteal secretion, impaired appetite, staring coat, variable temperature, hard frequent pulse, constipation, scanty, high-coloured and turbid urine.

Treatment.—The same measures recommended in pneumonia

and pleurisy are applicable here, and these should be promptly followed out; especially no time should be lost in applying active counter-irritation.

PLEURO-PNEUMONIA (CONTAGIOUS).

This destructive malady first made its appearance in England in 1841, and has unfortunately been more or less prevalent in this country ever since. Few diseases have commanded greater attention on the part of the Government, the veterinary profession, the agricultural world, and the public at large.

Contagious pleuro-pneumonia is a subacute disease, having its location in the interlobular exudation of lymph, attended by effusion in the thorax, and adherence of lungs, subsequently involving the pleura; it is of a specific nature, insidious in its attack, of variable progress, general fatality, and in cases of so-called recovery there is always a permanent defect in the lungs.

One attack, however mild, renders an animal insusceptible to another—hence the advocacy of inoculation.

Causes.—These are still involved in mystery. The disease, in the opinion of some, never spreads but by contagion; others are inclined to believe it has at times a spontaneous origin. Atmospheric influence, bad drainage, cold and damp, unsuitable food, and the like, may be accessory causes, but we have no proof that they induce the disease.*

Symptoms.—From the insidious character of the disease, the

* "All these influences, however, were more or less in operation for centuries in this and other countries before the disease appeared, and they are present in regions in which the malady is yet unknown; so that to none, nor all of them, can we attribute the spontaneous origin of the disease. If it is developed in this way, it must be through a conjunction of complex causes of which we have no satisfactory knowledge at present. It has been pointed out that, as we sometimes see the malady appear in localities in which there is no proof that strange cattle have been introduced, and that it prevails in countries which are quite isolated, the direct or spontaneous development of the disease cannot be denied. To this it may be answered that the history of the geographical extension of the disease is quite opposed to the theory of its spontaneous origin, and that the traffic in cattle from disease-centres sufficiently accounts for its diffusion and persistency in those localities which are scourged by it. It follows the lines of cattle traffic, and its manifestations coincide with the introduction of imported animals."—Fleming's "Veterinary Sanitary Science and Police," vol. i. p. 409.

earlier symptoms frequently pass by unobserved, or even if the indisposition is apparent, the attack may reach the second stage before it is recognised as pleuro-pneumonia.

In describing the symptoms, then, it will be convenient to divide them into the following stages: 1. The incubative stage; 2. Developed stage; 3. Acute stage.

First Stage.—The incubative period of pleuro-pneumonia may vary from one to eight weeks. On taking the average in outbreaks that have occurred in my own district, four weeks has been the usual lapse of time between the death of one beast and the recognition of illness in another.

I agree with Mr. Fleming, that "the earliest indication is afforded by the thermometer, a rise in temperature preceding the other signs." Indeed, many fatal mistakes might be avoided by the more general use of thermometry. When the temperature is over 100° suspicion should be aroused; when it reaches 103° we may be assured of disease, whilst 105° may be almost invariably considered sufficient for condemnation. Among the noticeable outward signs of disease, there is dulness; if at grass, standing aloof from the herd, the head hung, back arched, with spinal flinching on pressure, coat staring, diminished appetite, and sometimes arrested rumination. The secretions are more or less suspended (in cows, the sudden falling off in the quantity of the milk is frequently the first suspicious sign observed by the owner). Cough, however slight, is present throughout; but, to a great extent, is dependent for its frequency on climatic influence; hence, in wet or foggy weather it is more evinced. It will also generally be heard immediately the animal rises, or is moved about. 'This cough is characteristic,' in Prof. Walley's language, "usually single, short, and sharp, with the mouth open, the tongue protruding, and movement of the body suppressed as much as possible in order to prevent the production of pain in the act."

"Grunting is not so invariable an accompaniment of this stage as of the second; if it is present, it is performed synchronously with the act of expiration at irregular intervals, and is most certainly induced by giving the animal a sharp poke with the knuckles on the affected side, by the application of pressure over the intercostal spaces, or by causing it to turn sharply round. Striking the ribs, also, causes the animal to incline the head, with an oscillatory movement towards the side which is struck."

"The grunt will be of a short, painful character if the pleura is affected; oppressive, if the lung-structure only is implicated."

The pulse is usually quickened, but not to any marked degree at first, varying from 60 to 70, and firm. The horns and ears at the base are increased in temperature, and sometimes, though rarely, abnormally cool. The respiration is hurried, but not laboured. Rigors are generally present. At this stage the evacuations are not, as a rule, perceptibly interfered with. The eyes appear somewhat brighter than usual, and incline to be watery, more particularly if the animal be out of doors, while the membranes are injected.

Auscultation finally aids us in arriving at a correct diagnosis. By the experienced ear, the altered sounds are speedily noted, but even then a conclusion should not be arrived at too hastily. Every possible portion of the thoracic walls should be gone over. (Figs. 2, 3).

Prof. Walley observes, "In having recourse to auscultation, for the purpose of detecting abnormal sounds in the lungs, great care must be exercised to examine every accessible portion of the chest, as the disease is often at this stage very circumscribed, and a careless examiner may not detect what to others would be of great diagnostic assistance; the fact, too, that the liver impinges on the diaphragm on the right, and the rumen on the left side, and thus diminishes the posterior area of auscultation and percussion, must be taken into consideration. This area will be especially diminished if the stomachs are very full and the animal pregnant.

"The abnormal signs which may be detected on auscultation are: (a) Sibilus (wheezing), from diminution of the calibre of the small bronchial tubes by pressure of the effused serum external to them, or from tumefaction of the membrane itself; (b) Crepitation, from the effusion of serum into the bronchial tubes; (c) Friction-sounds, produced by the rubbing together of the partially dry pleuræ; and, (d) Patches of dulness, from effusion into the lung-structure and the air-cells. Increased murmur (puerile respiration) may be detected in the sound portions of the lung."

"Percussion—unless the lung is consolidated by effusion—assists us but very slightly in this stage."

Second Stage.—In this stage all symptoms of a febrile character are considerably aggravated. The temperature is high,

usually about 105°. Prof. Walley states, "If the fever has run high in the first stage, it will be somewhat subdued in the second, and *vice versa*;" but this is not a rule. The temperature rises generally and maintains a high standard until the terminal stage of the disease, when it usually falls. The pulse also gradually increases, and becomes more tense. The heart's action is indistinct or jerking. The respiration is laboured and accelerated. The animal stands obstinately in one position, and is reluctant to

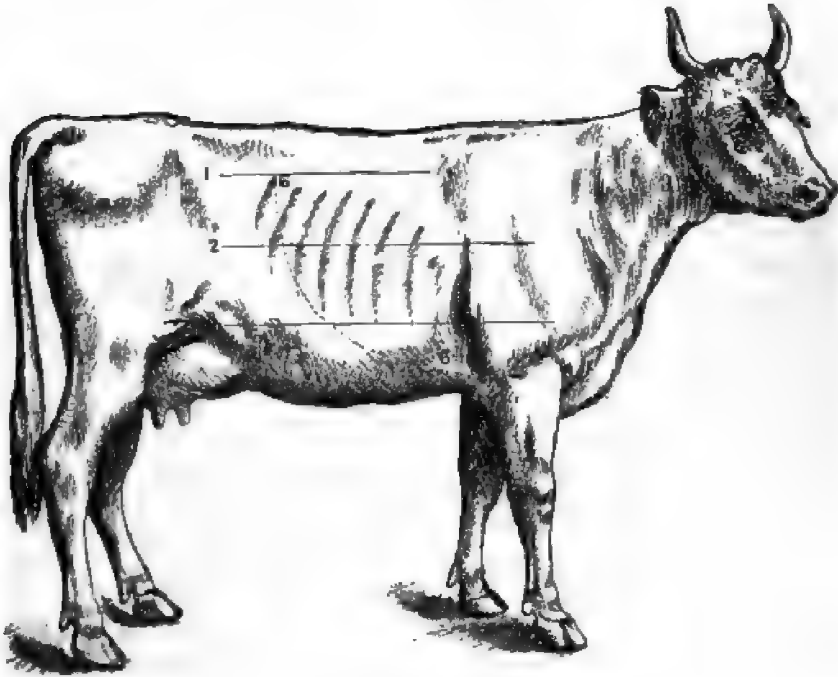


Fig. 2.—Cow, showing the extent of surface for auscultation on the right side.—*Gamgee*.

move, except with the hind feet, which are continually moved. If urged along, stiffness in the gait, particularly behind, will be observed, and the hind fetlocks knuckle over. The cough is more husky, frequent, and troublesome, and is provoked by the least exertion or excitement. The secretions are suspended, that of the milk being invariably absent, except a little thick yellow fluid which may from time to time be squeezed out of the teat. The

muzzle is dry, the eyes sunk, and mucous membranes injected. The evacuation of fæces is rare, and such as are passed are small in quantity, dark coloured, and hard. The urine is also scanty and high coloured. Appetite and rumination have ceased, and what little the animal drinks is swallowed with difficulty and pain. There are continual shiverings, grunts, and moans. The coat is harsh, dry, and erect, and the hide clings to the frame. The extremities are cold, and the spine excessively tender.

"In those cases in which the bronchial membrane is most involved tubular casts, more or less large, of lymph may be expelled by coughing and expectoration. These masses of lymph may be



Fig. 3.—Represents the heart and left lung *in situ*, the side of the chest being cut away.—*Simonds*.

colourless, or of a pale-straw colour, tinged with blood (from rupture of small vessels), or mixed with mucus and air-globules.

"Auscultation and percussion reveal important changes in the affected lung. There may be complete consolidation of the whole or part of a lobe, with blocking up of the bronchial tubes, as indicated by the absence of auscultatory murmurs: or dulness on percussion, over a larger or smaller area. On the contrary, there may be, on auscultation, bronchial respiration, and even a modification of bronchial voice (bronchophony), both being due to the larger bronchial tubes remaining patent, while the lung-structure around them is solidified. The bronchial voice only applies to the grunt,

or cough, the sound of which is conveyed to the ear through the consolidated lung and the ribs.

"If the consolidation is confined to the central part of a lobe, the posterior remaining comparatively free, so as to allow the air to permeate through it, a loud (almost whistling) to-and-fro murmur is heard.

"Absence of sound is due sometimes not to pulmonary consolidation, but to the formation of pleural adhesions; while if there is effusion into the chest, without consolidation or adhesion, there will be absence of murmur, and the water may be heard gurgling during the respiratory movements. The characteristic breathing of dropsy of the chest in the horse is seldom seen in the ox, and only in a modified form. All pleuritic sounds (except in fresh areas of disease) disappear when consolidation of the lung, adhesion of the pleuræ, or effusion into the chest takes place. If the left lung is consolidated, the sounds of the heart are often conveyed to the upper part of the right chest, at which point they are very audible; as also around the cardiac area.

"Puerile respiration in the sound lung becomes more pronounced as the respiratory functions of the affected lung become abolished."

Third Stage.—As in all lung affections, when approaching the finale, every symptom, until shortly before the end, becomes intensified. The breathing is hurried, more laboured, the nose poked out, the cough incessant and irritable, the pulse very rapid and indistinct, the eyes sunk and dull, the muzzle dry, and the margin of the nostrils incrustated; there is also sometimes nasal and lachrymal discharge, and around the lips viscid saliva. The horns and ears are cold, the skin is tight on the frame, having a contracted appearance. All the natural functions are in abeyance.

Tympany is frequently present with eructations, and small relaxed evacuations from time to time take place; the knuckling of the fetlocks and shuffling of the hind feet is more palpable. There is continual moaning, grunting, and grinding of the teeth. Dropsical effusions about the throat, sternum, and sometimes limbs, are not unfrequent. "Effusion is most extensive when the anterior lobes are affected, and the pericardium involved" (Walley).

Auscultation reveals little beyond the increased murmur in the sound portion of the lungs, with occasionally a cooing or whistling noise in one or two places. Percussion yields only dulness. Con-

siderable flattening may be often observed immediately behind the shoulder at the superior part of the chest.

"At this advanced stage," Mr. Fleming observes, "death is generally the inevitable termination, and its approach is indicated by hurried and anxious breathing, the expired air being often foetid; the cough is so frequent as to be almost continuous; the eyes and nostrils discharge a purulent fluid; the skin is dry, clings to the bones, and feels like parchment; the pulse is feeble, small, and extremely rapid, and the heart's beat tumultuous; the animal is unconscious, or regardless of what is passing around it; it is almost insensible to the infliction of pain, and can scarcely stand; oedema is perceptible in the region of the dewlap; when lying, it generally rests on its side, the neck extended, and the mouth open and discharging a viscid saliva; the mucous membranes become livid; loud groans are emitted; there is grinding of the teeth; the abdomen becomes distended with gas, a foetid diarrhoea setting in, the animal being in a state of extreme marasmus."

Prof. Walley remarks, "The breathing on the approach of death becomes oral; there is quivering of the facial muscles, and dribbling of saliva, and, if the animal is recumbent, it endeavours to preserve its equilibrium on the sternum, the head being protruded to its fullest extent, in order to facilitate respiration. The skin and hair become very dry and harsh; the former, especially in parts devoid of hair—as the vulva, udder, perineum, root of tail, ears, etc.—contracting a yellow tinge, and frequently covered with abundant bran-like scales from desquamation of the epidermis.

"On auscultation, no sounds except bronchial are heard in the affected lung; and on percussion there is an entire absence of resonance. Puerile respiration in the sound lung is more marked, while there may be crackling, as the result of emphysema, in portions of the lung, with dulness at the lower part, the latter being the result of collapse from blocking up of the bronchial tubes with serum, lymph-casts, or coagula of blood. Abortion in pregnant animals frequently takes place at this stage, and, on the whole, is favourable to recovery.

"If the pericardium is diseased, the pulse becomes irregular and the respiration gasping; the latter is also marked when the thoracic effusion is extensive. In these cases the animal usually dies suddenly. otherwise, death is produced by imperfect oxidation of the

blood (*asphyxia*), by suffocation as the result of regurgitation of serum from the tubes of the diseased into those of the healthy lung, the serum becoming whipped into foam by the passage to and fro of the air in respiration. Lymph-casts may also block up the tubes of the healthy lung, and lead to the same result."

Diagnosis.—"The diagnosis of this disease is a most important matter, as failure to detect it early may lead to very serious consequences" (Walley). I agree with Professor Walley in the above remarks, and will venture to go a step farther and say, a correct diagnosis is equally important for the reputation of the professional man, for should a mistake occur (especially through careless examination), and a beast be condemned for a disease it does not possess, not only is the declaration of the premises as an affected area a gross injustice to the owner, but it harms the veterinary profession generally by giving him cause to complain of the want of knowledge displayed by one of its members, and even when the authorities abide by the loss and pay for the mistake of their servant, it does not have the effect of glossing over what is apt to be spoken of lightly as 'only an error of judgment.' More than one case of this description has come under the author's knowledge.

Under these circumstances, I think the diagnosis given by Prof. Walley may be fitly transcribed here :

"In the early stages it is often a most difficult thing to give a decided opinion, and indeed, the practitioner should always be very guarded in expressing himself until the symptoms are well developed, more particularly if the disease is not already existent in the neighbourhood.

"Pleuro-pneumonia simple is of asthenic, zymotic pleuro-pneumonia of an asthenic character; p. p. occurs only as a sporadic, zy. p. p. as an epizootic affection. In p. p. abortion seldom takes place; in zy. p. p. it is frequent; in p. p. the lung (or its central portions) is attacked *en masse*, and shades off at the peripheries; in zy. p. p. it is diseased in patches (always defined, and more or less circumscribed), frequently located in the borders, and indicates different periods of existence. I have seen as many as seven distinct centres, varying in size from a walnut to a child's head, in the lungs of one animal. P. p. is not accompanied by albuminous or serous effusions into the muscular tissue of the body, neither are the lymphatic glands of the thorax so much diseased; while



SECTION OF LUNG TAKEN FROM A COW
AFFECTED WITH CONTIGUOUS PLEURO-PNEUMONIA
ORIGINAL

the inflammatory products are not so acrid in their character as in zy. p. p.

"In p. p. there is seldom any want of correlation between the pulse, respiration, and temperature; in zy. p. p. the pulse may register 60, and the respiration 12 per minute; while the temperature may run up to 105° or 106°. In p. p. the cough is comparatively strong and bold; in zy. p. p., short, sharp, and laryngeal, and the grunt of the latter is always absent in the former disease. If there is expectoration, the expectorate is rust-coloured, or largely mixed with blood in p. p.; while in zy. p. p., it consists of fibrine-casts often streaked with blood, or mixed with small coagula. In p. p. the symptoms are asthenic, the attack sudden, and preceded by congestion; the injured lung tends to *organative* changes, and may be functionally restored, and the disease exhibits a certain amount of amenability to the action of medicinal agents. In zy. p. p. the symptoms are little marked; the attack is insidious, and not preceded by congestion; the injured lung tends to *degenerative* changes, and is never functionally restored; while the progress of the disease is very slightly controlled by the action of medicines. P. p. has no incubative stage, and is neither infectious nor contagious; zy. p. p. has a well-defined, though extremely uncertain, incubatory stage, and is alike contagious (by actual cohabitation) and infectious. In p. p. the primary effusion is of a plastic, in zy. p. p. of an aplastic character." (Post-mortem appearances, see "Pathological Anatomy," p. 29.)

"In addition to this affection it is liable to be compounded with: (1) Ordinary cold; (2) Pleurisy; (3) Indigestion, with or without congestion of the lungs; (4) Hoarse; (5) Tubercular phthisis.

"1. Ordinary cold is distinguished from it by the comparative mildness of the attack, by its evanescent character, by the accompanying catarrhal symptoms, by the lesser degree of interference with the normal functions, and by the temperature seldom exceeding 103°.

"2. In pleurisy the cough and grunt are more painful and shorter; the pain on pressure over the ribs is more marked; the mucous membranes intensely injected; the pulse hard, wiry, and very frequent; the respiration abdominal; and great pain is evidenced if the animal is made to turn suddenly. Temperature about 104° to 105°.

" 3. Indigestion is most likely to be confounded with zy. p. p. when it is accompanied by pulmonary congestion, and when the third stomach is the seat of the disorder. The grunt of indigestion is more indicative of inconvenience than pain, and cough, if present, is louder and bolder.

" 4. Differential characters and symptoms of hoose :

" 1st. Hoose is essentially an infantile disease, and is seldom seen in animals over a year old.

" 2nd. It frequently attacks lambs and calves simultaneously, and spreads regularly and at certain times of the year particularly.

" 3rd. The cough is an irritable bronchitic or husky one, and is frequently accompanied by expectoration of mucus, intermixed with which there will probably be strongyles, their embryo or eggs; the latter being detected microscopically.

" 4th. There are seldom any pleuritic sounds on auscultation, and no pain or palpitation.

" 5th. The grunt of zy. p. p. is absent.

" 6th. If diarrhoea is present, the discharges are natural in colour and odour.

" 7th. Febrile symptoms are less marked.

" 5. In the acute form it may be confounded with acute pulmonary tuberculosis; but in this disease the pulse is more frequent and irritable, and more in relation with the temperature and respiration; the diagnostic grunt of zy. p. p. is absent, and on auscultation there may be no consolidation, or, if present, it is patchy; previous history, too, is always a good guide.

" During the course of the secondary changes in zy. p. p. it is easily mistaken for *chronic pulmonary tuberculosis*. As a rule, the temperature is higher in the former than the latter, and on auscultation the partial character of the consolidation in tubercle is detected. Here, also, history and collateral evidence must be made use of if possible."

Pathological Anatomy.—The peculiar and altogether unusual appearances observed in the post-mortem examinations of animals which have been affected with pleuro-pneumonia, stamp it as being widely different from any other disease. The coloured illustrations attached to this chapter were made by the author from sections of lung belonging to infected animals coming under his own supervision as an inspector.



Fig. 6.

Section of a fossilized wood, showing the cellular structure of the wood, and the branching pattern of the wood, as seen in the section.

On opening the thorax of a beast well advanced in the disease there is usually found an abundance of serum with large exudations of attached and floating lymph. The pleuritic adhesions are often very extensive, and if such adhesions are separated the normally smooth surface of the pleure is observed to be considerably thickened and roughened with fibrinous deposit. The pericardium sometimes presents the same alterations as are observed on the pleure, and on account of the objectionable appearance of the latter over the ribs, butchers are careful to strip it off before submitting the carcase for sale, taking means to conceal from the inexperienced that it has been so tampered with by anointing the exposed surface with warm suet, white of eggs, gum, and other albuminous compounds. The trachea and bronchial tubes generally contain frothy mucus, and the smaller ones are very frequently plugged with solid exudate; indeed the minute ramifications in the diseased portion of lung are completely obliterated. The blood has been described as usually thick and viscid in the early stage of the disease and readily congluable.

The diseased portion of lung is remarkable for its consolidation and enormous weight. On making a section of it the peculiar marbled appearance presented in Figs. 4, 5, 6, and 7, is at once displayed. Bands of white fibrine of various degrees stretch in every direction; in other words, there is interlobular exudation or effusion of albumen, or fibrine separated from the colouring matter of the blood, into the connective areolar tissue of the pulmonary lobules, which are themselves compressed or hepatized. Various degrees of hue in the parenchyma of the lung are present, from a bright red or a magenta to a dark purple or mahogany, according to the duration of the disease and the amount of blood in the system. The affected lung is friable, easily torn, and when completely consolidated, sinks in water. In some cases suppuration is established, and large masses of diseased lung become detached, surrounded by lymph, or encysted. Purulent infection may occur from this pulmonary necrosis, or partial absorption of the dead lung may result, leaving the remainder as a foreign but harmless body in the thorax.

For a full and most able scientific exposition of the pathological anatomy of pleuro-pneumonia I refer my readers to Prof. Walley's treatise on "*The Four Bovine Scourges.*" I will just merely add

the differential appearances so ably given by him between p. p. and zy. p. p. and broncho-pneumonia:

"(a.) Zy. p. p. lung is distinguished from that of p. p. by greater weight (even in the early stages) and friability; by being much paler in colour externally, and variegated—*mottled*—internally; by different progressive stages of disease going on in the same lung: thus a section may show healthy lung-tissue, interlobular effusion, red, black, and green hepatization and brick-like hepatization (*sphacelus*); by being often diseased in patches, and the involved portions being always well defined and circumscribed; by the serum showing a greater tendency to gravitate to the lower and healthy portion of the lung, rendering them translucent, and of a buff or greyish-brown colour, and a solidified character—not unlike veal in appearance—without any distinct interlobular or subpleural effusion, and without absolute destruction of the parenchyma: by the extensive interlobular effusion, exudation and hyperplasy; by the transudation of large quantities of serum when the lung is incised or submitted to pressure—this serum sometimes coagulating on exposure to the atmosphere; by the ulcerations and ecchymoses of the bronchial mucous membrane; and by the condition of the thoracic lymphatic vessels and glands.

"In acute p. p. the lung, both externally and internally, as also the lining membrane of the bloodvessels and the bronchial mucous membrane, is uniformly red or black in colour, and devoid of the characteristics above-mentioned; it may crepitate slightly on pressure. A mortified p. p. lung is intensely black, sometimes green, often of a foetid odour, and the bronchial mucous membrane of a black or greenish hue; a mortified zy. p. p. lung is of a brick-red uniform colour, and very friable; and, finally, while degenerative processes, when they commence, proceed more rapidly in p. p., organative changes are more stable.

"(b.) Consolidated lung, resulting from entozoic or broncho-pneumonia, presents at first somewhat the appearance of foetal lung; the pleura is not often involved; the bronchial mucous membrane is intensely red, and is not often ulcerated; a section is parti-coloured—grey and red, the grey portions being friable and cheesy; the lung is not so heavy, does not exude much serum when pressed, does not show the same tendency to degeneration, and does not degenerate *en masse*, but in small circumscribed patches, leading



FIG. 7.

EXTERNAL SURFACE OF LUNG FROM A COW AFFECTED WITH
CONTAGIOUS PLEURO-PNEUMONIA SHOWING
DEPOSIT AND WHERE PLEURITIC ADHESION HAD EXISTED.
[ORIGINAL.]

to the formation of lobular abscesses and vomicae. In entozoic pneumonia filaria are found, either fully matured in the bronchial tubes, or as embryos with eggs (distinguished microscopically), in the consolidated lobules. If the consolidation results from the accidental introduction of minute foreign bodies into the bronchial tubes, the diseased lung-structure is firm; there is no interlobular effusion, and the secondary changes are most usually: 1. Suppuration, leading to the formation of circumscribed abscesses, large or small, numerous or few, according to the size, character, and number of the irritating particles: in some cases abscesses are replaced by encystment and liquefaction of the exudate, giving on transverse section a multilocular character; frequently, too, the foreign matter—as small seeds, portions of grain, or other vegetable product—will be easily detected in the bronchia, surrounded by an exudate, or lying in the centre of the cyst or abscesses. 2. Interstitial inflammation, with its usual results—hypertrophy and cirrhosis, consolidation from foreign bodies is usually located in the anterior lobes, or at the inferior border of the large lobes.”

Treatment.—This, were it allowed, should be essentially supportive; throughout the disease the preparations of iron, notably the sulphate and sesquichloride, combined with stimulants, produce the greatest benefit. 4 drachms of ferri sulph. in a pint of good ale or stout may be administered twice daily, or even thrice; or ferri sesquichlor. 1 ounce, with 4 ounces of brandy in a pint of water, at the same periods. Where great debility exists, the amount of stimulant may be increased, the brandy to double or treble its quantity and the ale in strength, or repeated at shorter intervals, say every three hours; bleeding should never be resorted to. If constipation is present, linseed oil, with the use of enemas, forms the safest means of overcoming it. Counter-irritation applied to the sides is exceedingly valuable; when especial activity is required, as when the lungs are considerably advanced in disease, a long seton, obliquely inserted on either side and stimulated to discharge, is of greater benefit than mustard, embrocation or blisters. The body should be kept warm with clothing, but fresh air without draught should be freely allowed. Cleanliness and disinfection are also important matters. Carbolic acid as a disinfectant stands pre-eminent.

The diet should be of a nourishing character, easy of digestion,

and laxative rather than otherwise. Well-boiled oatmeal gruel, linseed-tea and the like, should be administered several times a day. Nitrate of potash may be with benefit put in the drinking water.

A decrease of temperature, deeper and longer inspirations, less frequent cough, absence of grunting, inclination for food, and less pulse will denote amendment.

From the "Report of the Commissioner of Agriculture on the Diseases of Cattle in the United States, 1871," I transcribe the following remarks on the treatment of Lung Plague; more, however, as a pathological contribution than correct treatment, as I should take strong objection to certain of the measures advocated—to wit, bleeding and the administration of tartar emetic:

"Sauberg, in his prize essay published in 1846, devoted a chapter to the therapeutics of pleuro-pneumonia, but he is not sparing in words of caution, and in impressing on the minds of agriculturists that there is no specific against the disease.* He indorses Delafond's practice of blood-letting, and says that, if this is resorted to at the right time, the animal improves at once. If the patient is young, robust, in good condition; if the mucous membranes are red, the pulse small, hard, and frequent, breathing short and quick, heart-beats scarcely to be felt, then ten to fifteen or twenty pounds of blood must be abstracted. It is only by this means, says Sauberg, that the abundant exudation of plastic lymph in the lungs, as well as other evil results, can be averted. If no improvement is observed within eighteen to twenty-four hours, a second and even larger blood-letting must be performed. After the fifth day of an attack of pleuro-pneumonia Sauberg rarely bled, and whenever he did so, he observed great prostration and often death. It is evident, he says, that, whereas an early bleeding may prevent the exudation, should this have taken place, the loss of blood may undermine the vital powers so as to prevent the possibility of recovery.

"Sauberg is one of the strongest advocates of derivatives. He recommends a seton on the dewlap, or one on either side of the chest. He also advises a blister, spread over a surface deprived of hair to the extent of a man's hand, behind each shoulder-blade. The vesicant he uses is a compound of potassio-tartrate of antimony, powdered cantharides, and euphorbium, of each three quentchen; lard, four loth, and one loth of oil of turpentine.

* At page 131 of Sauberg's work, already quoted, the author says: "Wir haben kein Arcanum gegen die Lungenseuche des Rindviehes und werden auch keins finden; wenn man nur berücksichtigt wie die Krankheit bei den einzelnen Thieren so verschieden ist, und die Mittel die bei einem Kranken mit Nutzen angewandt, bei dem anderen, wenn nicht Nachtheile, doch nicht gleich günstige Erfolge zu Wege brachten, so wird man sich wohl bescheiden. Wo der Landmann die Behandlung der kranken nicht einem Therapeuten anvertrauen kann oder will, sollte er nur nach allgemeinen Grundsätzen verfahren, eine zweckmässige Diät anordnen, und nicht sein Heil in kostbaren Mitteln suchen, der Verbreitung der Seuche möglichst vorbeugen, und, wo Heilung der Erkrankten nicht möglich ist, das Schlachten vorziehen."

He also suggests the application of the red-hot iron to the sides of the chest. In slight cases, rowels dressed with black hellebore suffice. The quicker and more active the results of these applications, the more favourable is their operation.

"The internal remedies recommended by Sauberg, consist mainly of tartar emetic, which, he says, is attended with the best results. He gives it in the morning in one or two drachm doses, with two or three ounces of sulphate of soda, an ounce of nitrate of potash, and half an ounce of powdered juniper berries. This has an effect on the animal's bowels. In gastric or bilious complications he gives the emetic tartar in two to four ounces of white soap.

"When the fever is slight, the cough strong, and appetite good, Sauberg advises not to bleed, and the same applies to old and weak animals, especially cows liable to abort, etc. He still persists in the tartarized antimony, and gives it with ten to sixty grains of assafetida, and an ounce of powdered juniper berries, twice daily in water. Bitter herbs, oil of turpentine, camphor, tar-water, arnica, fennel, etc., are remedies suggested.

"A wise precaution is insisted on by Sauberg, and that is to avoid a profuse and debilitating purgation.

"The practice recommended by Delafond and Sauberg has very largely been carried out and recommended by other authors, such as Kreutzer, Roll, etc., even of late. Roll adds to the treatment by bleeding, tartar emetic, etc., the administration, in cachectic and feeble animals, of sulphate of iron with tar-water, or of alum, tannin, mineral acids, and other tonics.

"In England practitioners have resorted to various methods of treatment. The practice of blood-letting has long been abandoned, but the advocates of setons, and more particularly of active blistering agents, such as croton oil, cantharides, and tartar-emetic ointment, still exist. Small doses of calomel and tartar emetic, stimulating draughts containing creosote, turpentine, sulphuric ether, carbonate of ammonia, and alcohol, have been more generally employed. Mineral acids, the administration daily of dilute sulphuric acid especially, and an early resort to mineral and vegetable tonics, have found their advocates. Of late years the tincture of aconite has been in favour as a febrifuge, and largely used, and some have tried Indian hemp and other narcotics. Everything has been tried, without much reasoning or careful record of results. The important salient feature in the history of pleuro-pneumonia in England is that all the therapeutic skill of the veterinarian has not prevented greater and more general losses than have ever been witnessed in other countries, if we may except Holland.

"For some years I have noticed that the earlier lesions of the lung-disease partake, in their character and results, more of the features of hemorrhage—a prostrating discharge from the bloodvessels of a sero-albuminous product—than of inflammation. The congestion and inflammation are truly secondary, and once developed it is apparently impossible to control them, though their extent varies greatly. In some animals but a portion of one lung is involved, in others one entire organ is affected, and in others, which cases are almost without exception fatal, both lungs become hepatized, and the animal dies sooner or later of apnoea or suffocation.

"Notwithstanding the well-founded objection of some distinguished veterinarians to the practice of administering mineral astringents as pre-
servatives—an objection to which Professor Nicklas gave utterance at the

first International Veterinary Congress, held in Hamburg in 1863—it is certain that they far surpass all other means in the treatment of the early stages of the lung plague. Professor Nicklas said, with much truth, that where pleuro-pneumonia appeared, there were often persons who prescribed the sulphate of iron to check the progress of the disease. The isolation of such cattle was not attended to, and the malady continued; whereas if the sick had been isolated, or slaughtered, and the remaining animals of a herd inoculated, there would have been an end to the outbreak.

"On the other hand, if attention is paid to the segregation of the sick, and those indubitably free from the disease are inoculated, there is still a number, and often not a small number, sure to die within a month or six weeks, simply because inoculated too late. These animals, if of great value, and proper facilities are afforded for treatment without incurring the risk of extension of the malady, may often be treated with success.

"Thermometer in hand, a good observer and auscultator can detect the invasion of this disease some days—and even as long as ten days or a fortnight—before marked symptoms appear. At that stage, the peculiar yellow deposit which first slowly invades the interlobular tissue of the lungs is penetrating into the organ, and its extension may, as I have noticed frequently, be checked by active internal astringents. The best of these are the sesquichloride and the sulphate of iron. But our choice extends further, since vegetable infusions or decoctions containing tannin, besides the astringent preparations of lead, may retard and arrest the exudation.

"I have on several occasions been called to prescribe for herds in which I have readily traced cases of pleuro-pneumonia in advanced stages of the disease. I have removed the marked symptoms, and still a large proportion of the animals had the peculiar cough so well described by the French commission; yet, to have neglected means to arrest the disease would have resulted in many deaths. Before I was led to approve, as I do strongly, of the practice of inoculation, and since, when there have been insuperable obstacles to its adoption, I have placed all the herd, sometimes in the stable and at other times in the open field, on regular daily doses of sulphate of iron, allowing about half a drachm or a drachm to a bullock, mixed with a similar amount of bruised coriander seeds and perhaps some bran, the better to disguise the iron. Thus mixed with fresh coriander seeds, cattle will leave grass to eat the medicine, and I have uniformly found a mitigation of the cough, a disappearance of the malady, and the herds have preserved an admirable condition.

"I can confirm Sauberg's statement that it is dangerous to resort to active purgatives, and the common symptom of constipation, even in the earlier stages of pleuro-pneumonia, can be better corrected by diet and the administration of a stimulant, such as carbonate of ammonia, combined with warm-water injections, than by any other plan. When the exudation in the lung-tissue is not checked, and in all cases where it has advanced too far to admit of being checked by capillary astringents, it is, as a rule, desirable to leave animals entirely to nature.

"The observation of many hundred cases within the past fifteen years has convinced me that, left entirely to themselves, when the malady has fairly developed, a considerable proportion of the cattle affected in one lung recover, whereas nearly all those affected on both sides die. The many methods of treatment recommended have not seemed to increase the average of recoveries among cases of one-sided pleuro-pneumonia.

"It is extremely difficult to ascertain the conditions under which a small or a great mortality may be anticipated. This may be gleaned from the observations of the French commission. They found some animals which apparently resisted the disease. These were doubtless latent cases, as they afterwards resisted contagion. If this be admitted, the mortality amounted to thirty per cent. of the animals affected, and this mortality is infinitely less than that observed frequently under circumstances which would appear most favourable to the health of cattle and their resistance to disease.

"It has been seen that, as far back as 1769, fumigations were recommended for the treatment of pleuro-pneumonia. Of late years carbolic acid has been strongly recommended for this purpose, and may prove beneficial. Its internal administration failed many years ago, when, under the name of creosote—for much of our foreign creosote is carbolic acid—it was used especially by a distinguished English veterinarian, Mr. Charles Hunting, of Fence Houses, near Durham. The employment of antiseptics comes properly under the head of preventive measures, which are considered in a subsequent section of this report.

"Notwithstanding the many authorities in favour of blisters, setons, rowels, and even the hot iron, I must assert from careful observation, that in the acute stages of the disease, they invariably aggravate the malady, and sometimes kill. There are instances which indicate the contrary, for, when examining cases in Pennsylvania, I was told by a farmer that his cattle were dying, and he called in a professional man, who blistered severely and cured several. They would probably have recovered if left to nature, though it is possible that in some cases counter-irritants may be useful. The difficulty is to choose those cases; and, as a rule, I am satisfied that any but the mildest stimulants applied to the skin irritate and do harm.

"It is highly important that any medicines given to cattle with this disease should be given carefully, to avoid choking. Farmers are often very rough in giving drenches to cattle. They should go up to the off-shoulder of the animal, pass the left hand into the angle of the mouth on the left side, draw the head around gently, without unduly elevating it, and pour the draught out of a small horn in moderate quantities, giving the animal time to swallow. I remember, as far back as 1851, being asked by a Yorkshire veterinarian to prepare a number of draughts, the active agent of which was carbonate of ammonia, for a herd of cows affected with the lung disease. The draughts were supplied to the farmer, and the very first day they were being administered by himself and servants, according to order, in gruel, a messenger summoned me to attend an animal which was killed by the medicine. On arriving at the farm, I perceived from the animal's breathing, tremors, difficulty in standing, anxious expression of countenance, protruding and blood-shot eye-balls, that it was choking. I informed the farmer of the fact that the drench had been poured the wrong way, and, since he was indignant at the declaration, I opened the trachea with my penknife, and in a fit of coughing a quantity of gruel, smelling strongly of ammonia, was forcibly ejected. This alone saved the reputation of the medicine and its compounder."

Preventive Measures: Inoculation.—There still exists a considerable division of opinion as to the advantages derived from inoculation. Authorities in the veterinary profession are represented in a small

minority as believers in this operation as a protective measure. Nevertheless that minority has made most positive assertions as to its value—assertions on which perfect reliance can be placed—assertions based upon *not* what they have heard or read, but as the result of searching investigation and ocular demonstration. During a visit to Australia in 1872-3, I had ample opportunity of discussing this matter with those interested in it, and especially with one who had adopted it, he assured me, with great success, viz., Mr. Graham Mitchell, F.R.C.V.S., Melbourne. With Mr. Alexander Bruce, Chief Inspector of Sheep for New South Wales, a gentleman of considerable practical experience and ability, and who was a fellow-passenger with me to England, I derived much valuable information. An article on the subject from his pen appears in the *Veterinarian* for August, 1873. Indeed, the results of inoculation had been so favourable, that I was informed many of the colonists were desirous that it should be made compulsory. Mr. Angus, the well-known colonial short-horn breeder, also last year assured me of its value from his own experience. While an old schoolfellow of mine, during a visit home from the Cape this year, spoke highly of it.

The operation was introduced in 1850 by Dr. Willems, Hasselt, Holland. Prof. Simonds, who was appointed by the R.A.S. to inquire into the value of Dr. Willems' treatment, gives the result of his investigation as follows:

"1. That inoculation made by superficial punctures, and simple erosions of the skin, invariably fail to produce any local inflammatory action, being the reverse of the case with regard to the vaccine disease, smallpox, and other specific affections of which it is an indication of success.

"2. That the employment of fresh serous fluid, and a cleanly-made but small incision, during the continuance of a low temperature, will almost always fail to produce even the slightest amount of inflammation.

"3. That deep punctures are followed by the ordinary phenomena only of such wounds, when containing some slightly irritating agent.

"4. That with a high temperature, *roughly-made* incisions, and serous fluid a few days' old, local ulceration and gangrene, producing occasionally the death of a patient, will follow inoculation.

"5. That the sero-purulent matter taken from an inoculated sac

causes more speedy action than the serum obtained from a diseased lung, and that 'removes' cannot be effected on scientific principles.

"6. That oxen are not only susceptible to the action of a *second*, but of *repeated*, inoculation, with the *serous exudation* of a diseased lung.

"7. That an animal inoculated with the serous exudation is in *no way protected* even from the *repeated action* of the sero-purulent fluid, which is produced in the wound, as a result of the operation.

"8. That animals not naturally the subjects of pleuro-pneumonia, such as donkeys, dogs, etc., are susceptible to the local action, both of the serous exudation from the lung and the sero-purulent obtained from the inoculated wounds.

"9. That the serous fluid exuded from the lungs is *not a specific virus or lymph*, as it is sometimes designated.

"10. That inoculation made with medicinal irritating agents will be followed by similar phenomena to those observed in inoculations with exuded serum.

"11. That inoculation often acts as a simple issue, and the security which at times the operation apparently affords depends in part upon this, but principally on the unknown causes which regulate the outbreak, spread, and cessation of ordinary epidemics.

"12. That inoculation of cattle, as advocated and practised by Dr. Willems and others, is not founded on any known basis of science or ascertained law with regard to the propagation of those diseases commonly called specific.

"13. That pleuro-pneumonia occurs at various periods of time after a so-called successful inoculation.

"14. And lastly : That the severity of pleuro-pneumonia is in no way mitigated by previous inoculation, the disease proving rapid in its progress, and fatal in its consequences in an *inoculated* as in an *uninoculated* animal."

As opposed to this conclusion, in which other professional investigators coincided, I transcribe an address on the subject by Mr. Rutherford, M.R.C.V.S., delivered on the 12th of February, 1879, before the Scottish Veterinary Medical Association :

"In accordance with a promise made about a year ago, I purpose in this my inaugural address, to give you a sketch of the history of inoculation for

the prevention of Zymotic Pleuro-pneumonia, its practice, etc. In Gamgee's '*Domestic Animals in Health and Disease*,' published in 1862, we find it recorded that Dr. Willems, of Hasselt, in Belgium, suggested and carried out in 1851 inoculation with the virus of pleuro-pneumonia, in order to induce a mild form of the disease in healthy animals, and so prevent the decimation by attacks due to contagion. The work met with much encouragement, but perhaps quite as much opposition; for while many accepted Dr. Willems' results as incontestable, and wrote advocating his mode of checking this destructive plague, as many more, notably Riviglio, a Piedmontese veterinary surgeon, ably contested the validity of the conclusion arrived at by Willems. Gamgee further records that in 1854, a commission was appointed by the French Government to make investigations into the subject, and that although they in part confirmed Riviglio's unfavourable opinions, they, from the incompleteness of their experiments, recommended a further trial of it. Gamgee himself at this date (1862) was evidently violently opposed to it; for we find him say, 'The practice of inoculation is one which I have to condemn from experience,' and that any good which follows its adoption is such as would follow the use of setons, and is obtained at the cost of a certain percentage of deaths, and cases of gangrene of the tail. Again, on the same subject he says, 'The all-important question, Is inoculation of service? has been solved, for the Belgian and French commissions, Riviglio's, Simmond's, and Herring's observations, with those of many more (added, I presume, to his own experience), prove that, while a certain degree of preservative influence is derived by the process of inoculation, it does not arrest the progress of disease.'

"I desire you, gentlemen, to note that opinion, published by Mr. Gamgee in 1862; for further on I shall be able to show how completely it has been upset.

"Holding the opinion he did in 1862, it appeared strange to me that he should, in company with Herring—another dissentient—at the first international Veterinary Congress, held in Hamburg in the following year, 1863, be a party to a resolution which was passed to the effect that the inoculation of cattle should be made compulsory. At that Congress there were present, in addition to Gamgee and Herring already mentioned, Professors Gerlach and Hertwig, of Berlin; Roll, of Vienna; Nicklas, of Munich, and some others equally eminent, and it is worthy of note that no opposition was raised to the resolution. It may have been that they did not think it worth while, believing in the then unsatisfactory result of inoculation being sufficient to deter any Government from giving effect to the resolution; but it may also have been that their minds were not fully made up—that, in short, while sensible that in inoculation there existed a beneficial result it was not such as they would require to have before subscribing fully to it. Whether or not the Continental veterinary mind is any clearer on the subject now, I cannot tell you. Gentlemen, I am afraid it is not, else we would have heard more about it."

"In this country, then as now, I believe I am correct in stating that the veterinary profession were and are against the practice; at least all with the exception of a very, very few—so few that they may be counted on the five

* In '*Veterinary Sanitary Science and Police*,' vol. i., will be found a résumé of Continental opinion on the subject up to 1875. At an early date we purpose referring to still more recent evidence.—Ed. *V. J.*

fingers. I have been particular in noting the state of the veterinary mind at that time, because from my own experience I am fully convinced that the adverse verdict arose from the misapplication—I would use a stronger term, 'ignorance'—of the true method of inoculation and blindness to the conditions which are necessary to its successful practice.

"The measure of success with which, however, inoculation had in some instances been attended, was happily quite sufficient to keep it from dying out. Slumbering on the Continent, tabooed in this country,* it yet managed to gain a footing in Cape Colony, where, to the best of my belief, it is still practised. From the Cape it found its way to Australia, and was first successfully tried there in 1862, the very year—strange to say—in which it had been so unhesitatingly condemned by Gamgee here.

"Introduced by a cow landed in Melbourne from England in 1858, pleuropneumonia had gradually, but none the less surely, spread from Victoria to the neighbouring colonies of South Australia and New South Wales, and from thence into Queensland. All attempts to stamp out the disease by quarantine and wholesale massacre proved useless, and as the rapid march of the scourge bid fair to deprive the country of one of its principal sources of wealth and economy, stockowners began to consider if there was no other method of combating it.

"It was then that inoculation was tried, by first one and then another, and so on; and although it must have been under very adverse circumstances, the results were largely satisfactory; so much so, that for a time the operation became a very general one, as it is at the present time.

"It must not, however, be supposed that its introduction there was unopposed, or that its growth has been a regular one. On the contrary, to my knowledge it has met with very severe handling, hostile criticism, and, in some isolated instances, I believe, condemnation. At first its success in the hands of a careful few was all that could be desired; but as its more general adoption grew with men's fears of the disease and its rapid spread throughout an extensive country, those best acquainted with the mode of operating and the necessary precautions to be observed were unfortunately too few to be of much avail in preventing the operation from getting into the hands of adventurous anybodies—whose sole aim was the filling of their pockets for the time—not the successful application of that which they pretended to practise.

"You may imagine the results. The deaths from casualty and malpractice were quite as many as from the disease. Frequently the cattle were not inoculated at all; so that between mal-inoculation and the disease, they were often worse than they would have been if left alone. This was notably the case in Victoria and Queensland; but not so much so, I believe, in New South Wales, where the most intelligent personal efforts of Chief Cattle Inspector Mr. Bruce to instruct had, as they continue to have, the best possible results.

"Up to 1868, I cannot say that I had given the subject of inoculation any consideration. As a student I knew its literature and of Mr. Gamgee's attempt to introduce it into Edinburgh (that of course, prior to 1862), and also of its ignominious failure in his hands; and as I had no means of knowing that

* We have always been favourable to the practice of inoculation, and have done our best to obtain for it at least an extensive trial. This will be evident by reference to the work just alluded to.—ED. V. J.

the failure arose from the operation being grossly wrongly performed, if I had any opinion at all, it was, I would say, an adverse one.

"In the year mentioned, however, and yearly afterwards up to 1874, I had occasion to be in Australia, and had my attention drawn very strongly to the subject by Mr. Graham Mitchell. That gentleman was kind enough to furnish me with the fullest information with regard to it; more, he demonstrated its efficiency so convincingly that I have to acknowledge that it is entirely to him I owe the debt for any credit which has attached itself to my work here in Edinburgh. Mr. Mitchell, I believe, has to be credited with the honour of being the first uniformly successful practiser of inoculation, and has reaped his reward.

"I have now brought the sketch down to 1874, in which year I returned to this city; and although I had almost immediately abundant opportunity of trying conclusions between inoculation and pleuro-pneumonia, I found the disastrous results obtained by Gamgee so vividly in the recollection of the dairymen that it was impossible for a time to get anyone to permit of its re-trial. I must tell you I did not promise that the thing would be a certainty, because my experience of it in Australia was derived from what I knew of its operation upon cattle living a natural life, under very superior climatic and other conditions, in which respect they differed very materially from the great bulk of our subjects here, at any rate from my subjects—dairy stock, existing under what may be termed high-pressure conditions. I knew, however, that the disease abroad was the same as here, and was of opinion that if Mr. Mitchell's method was adopted in preference to that on the Continent, that we would get Mitchell's results. That my opinion was correct has been fully and conclusively verified.

"I have made an abstract of my last year's work, and I find that I commenced to inoculate on the 1st of February, and I left off on the 1st of November. During that time I inoculated in seventy-eight different localities, all of which, with the exception of fifty-one, were within three miles of this room.

"Of these places there were

Infected at date of operation	70
Not infected within three months prior . . .	2
Not " " six months prior	3
Never "	3

"The number of animals inoculated was 1596, all of which, with the exception of twenty-eight, were milch cows.

"Of this number 1511 were inoculated when the disease was in the byres in which they were housed.

46 had not been exposed for three months to an infected animal in their byres.

21 had not been for six months.

and

18 never, so far as the byres were concerned.

"Of the gross total, I lost a fraction under five per cent. from casualty, the result of inoculation and from failure of inoculation to give immunity. I would, however, ask you, gentlemen, to bear in mind this very important circumstance, that five per cent. of casualty is a very much lower death rate than has been yet obtained; and as my work last year was largely experi-

mental, I am sensible its being so, increased my average. I am fully of opinion that, entering this year again upon the same course, with my last year's experience, I shall, if spared, be able in another year to report to you a still lower one. My death-rate was not in proportion to the individual number done in individual instances, but to the systemic conditions under which they were done, the mode of operation, the weather, etc. Hence it is that I say I have now a knowledge of a great deal to be avoided, which I had not last year. Taking the systemic conditions first, I find that it is not advisable to inoculate cows immediately before calving. I would not like to do it upon any cow that had less than eight or ten weeks to run; nor is it advisable to do it immediately after calving. At least fourteen days ought to be allowed to elapse, and it should only be done then, if the animal has both locally and constitutionally recovered from parturition.

"It should not be done, but deferred, if there is the slightest degree of inflammatory action in any part of the body; in short, the animal should be, as far as we can ascertain, well in all respects. It should not be done if we consider the animal to be already affected with pleuro-pneumonia; but, at the same time, I must tell you that I have reason to think that there is a stage of the disease, the very earliest, when if inoculation is performed, good results may reasonably be expected to follow. I do not advise it, however.

"It is not advisable to inoculate in very hot weather, such as we experienced last July, especially if the animals are in close, confined, and badly ventilated byres; and it is still less advisable to inoculate during the winter months, unless special arrangements can be made for maintaining a uniform warm temperature. It is not, in my opinion, advisable to inoculate with any but one kind of virus, and that should always be fresh and absolutely free from any foreign matter; nor is it advisable to adopt any modification of the true method of inoculation. During last summer I tried several plans with the view of obtaining perfect results with less risk and inconvenience to the animal; but I have, as the result of my experience, resolved not to do so any more. The very few animals that I have had take pleuro-pneumonia within a reasonable time after inoculation—say, after a month—have invariably been animals inoculated mildly; in fact that had not been inoculated at all, as compared with others. I would ask you to note that mild or modified inoculation is not to be depended upon, and should not, therefore, be practised. I am of opinion that there is only one mode of inoculation, and shall now describe it.

"The virus or lymph should be obtained from an animal not too far gone in the disorder, and from one that is in other respects in fair condition, and free from other disease, as for instance, tubercle. 'Lymph' is the amber-coloured liquid exudate found in the interlobular tissues, between the pleural membrane and lung, and occasionally in semi-coagulated masses between and on the surface of the pleura. Too much care cannot be taken in selecting the lymph to be used; as its fitness is the most important thing in connection with the operation. I have said select and use only the liquid amber-coloured exudate free from blood, serum, and other extraneous matter; do not on any account be tempted to use anything else. The want of due care in this respect was one of the chief causes of the failure of inoculation in Gaingee's hands, as it has been in that of others, and would be again in like circumstances.

"Having obtained your lymph, you saturate with it as many pieces of white

worsted, eight to nine inches long each, as there are animals to operate upon. The instruments required are a pair of strong clipping scissors, a pair of rowelling scissors, and the needle. The latter should be four-and-a-half inches long, about a quarter-of-an-inch broad, rounded on the edge, and carefully tempered, so as not to break or bend, lancet-shaped at the point, just behind which it should be pierced with a long eye and be slightly grooved for retention of the thread. It should be fitted with a small handle, to facilitate the passing of it through beneath the skin.

"The proper place to inoculate is the tip of the tail. Of course you can inoculate any part of the body; but the tail-tip is to be preferred, because you get perfectly good results from operating there; and if, during the process that follows inoculation, it should become necessary to remove it, such may be done with no risk and little inconvenience to the animal. Further, extensive swelling of a specific character, and gangrene, are less likely to follow the operation when the tip is selected, in preference to the root of the tail.

"In operating you require the assistance of two men and a lad: one man to hold the animal by the head, one to distract her attention behind with one hand, while with the other he grasps the tail firmly to prevent it from being whisked out of the operator's hand. The lad is required to hold a saucer, containing the threads, ready saturated in the lymph, to be used.

"The operator, standing behind the animal, seizes the end of the tail, and with the scissors removes the hair, beginning an inch or so from the extreme tip, and clipping upwards for five or six inches, and leaving only a short tuft at the end. Then with the rowelling scissors he makes two transverse cuts through the skin on the posterior aspect of the tail, leaving a space of three inches at least between the cuts. The needle is then slightly dipped into the lower cut, passed upwards and outwards through the upper cut, and turned round sharply several times to enlarge the channel. Then threading the needle with a doubling of the worsted, he carefully withdraws it, leaving the saturated thread in the tail; and after cutting any too-long ends of the worsted off, the operation of inoculation in its first stage is complete.

"Within two or three days after inoculating, the part operated upon becomes slightly swollen, painful, and erythematous, but there is no discharge from the orifice, similar to what we get from the introduction of an ordinary seton; the swelling locally increases; and although the tail above may not be in the least degree swollen, the animal is not able to lift it. About the ninth day the skin is observed to take on a yellowish tinge, there is a rapid desquamation of the cuticle, followed by an exudation on its surface of beads of amber coloured lymph, similar to that introduced, and possessing similar properties. It usually takes from nine to twelve or thirteen days for the exudate to make its appearance. Occasionally a longer time is required, but when it does appear, inoculation may be considered to have been successful, and the second stage is complete.

"There are two courses now open to the operator, and much of the success of the operation depends upon which he will adopt. He may elect not to interfere with the process, but allow it to run its course, which, under ordinary circumstances, will be death and wet gangrene of the end of the tail, followed by its being thrown off. This is usually done by nature establishing a line of demarcation above the gangrenous end, sufficiently powerful to resist the spread of the gangrene. It is, however, impossible to be certain

of this line being drawn, or the position of it ; and the risk is then materially increased of gangrene spreading upwards towards the root of the tail, where it becomes highly dangerous. For this reason, I advise the non-adoption of the plan of allowing the process to run its own course. I find the best plan is to remove the end of the tail, when once inoculation is fairly established. There are cases in which this must be done even earlier, and there are others in which it may have to be accomplished more than once ; as, for instance, when the sudden setting in of coldness of the end of the tail indicates the death of the part. The best guide we have for knowing at what place to amputate is obtained by examining carefully the end of the tail. The part to come off may not necessarily be cold, but it will be wet with exudate and probably somewhat discoloured for an inch or so above it. I find that where amputation is practised early—say on the twelfth to the fourteenth day—that it is not necessary to make the division more than a finger's breadth or so above the upper incision made in inoculating. The amputation should be followed by profuse bleeding. If not, and if on examining the end of the stump we find clotting of blood in the vessels, amputate again higher up till bleeding follows. Neglect of this measure is apt to be followed by gangrene, in fact, the engorged vessels are an indication that it has already set in.

“ Where a number of animals have been operated upon, you will find that several of the tails will, after amputation of the inoculated portion, scab over and heal almost at once without further inconvenience. In the greater number of cases, however, swelling of the end of the stump sets in (and so long as it remains warm, no anxiety need be entertained), followed by suppurative process and the throwing off of a small portion of the tail. This process, I have said, is not to be feared ; neither is the formation of abscess higher up, so long as it is confined to the tail. All the local treatment necessary is fomentation twice or thrice a day with carbolized water, and the dipping of the end of the tail in a strong solution of carbolic acid—the latter always after milking. A large percentage of the cases heal up by the end of the fourth, fifth or sixth week ; but very few extend beyond these periods, unless abscess has formed at the root of the tail. I must point out that this is not ordinary abscess, but is owing to the localization in the part of the peculiar inflammation induced by inoculation ; to the formation of exudate in a firm solid mass and to its subsequent partial liquefaction, when softening and pointing of the skin take place.

“ I have said that the abscess following exudate deposit at the root of the tail occurs occasionally as an ordinary sequel of inoculation ; but more often it is the result of a kick when the animal is lying, or a blow with a milking-stool or stable-fork, either of which, I regret to say, is much too frequently administered. When the result of external injury, the swelling is usually on either side of the tail, over the ischiatic prominences, on the butt of the tail, or the quarter ; I have also seen it on the ribs, the shoulder, and front of the sternum, in which situation the provocative is a bruise in lying down, or against the trevis-post or feeding-trough. So long as abscess forms there is no danger to be apprehended ; but if, instead of abscess, you get extension of the exudate, loss of appetite and symptomatic fever, the case becomes a grave one, and the animal had better be slaughtered. In like manner should she be treated when the urino-genital organs and region become similarly affected, from extension of the exudate from neighbouring

parts. The condition presented by a cow in the latter circumstances is so painful, that we may congratulate ourselves it is not of very frequent occurrence; and I am satisfied that experience will do much in the way of rendering it less frequent.

"Scarification of the exudate has been recommended by the Australian authorities, but my experience does not bear out its practice; on the contrary, the one thing that affords relief is constant fomentation with water almost too hot to bear and strongly carbolized.

"Males, young stock, and calves, I find from experience can be inoculated with little or no risk, in Australia the percentage of death and casualty being lately given as low as two per cent. During last season, I inoculated only about thirty bullocks, but I did a considerable number of calves in different infected places, and with the best possible result—no casualty, and as yet perfect protection. This is a very important fact; for should inoculation ever become general in the country, the necessity for doing it upon our home-bred stock when purchased into dairies would be obviated by their being done at an early period of their life, when the operation, while being equally protective, is attended with little or no risk, and does not call for any after attention and treatment.

"I have nothing to say to you on the subject of diet while animals are under the operation. I have inoculated under all conditions in this respect, and find that the diet only requires to be rather below than up to the mark in quantity for the first three weeks, and of a nature calculated to maintain the perfect health and function of the stomach and bowels. The French commission, I think, recommend a saline purgative about the eighth or ninth day; and to some kinds of stock I believe the medicine would be of great benefit. There are objections, however, to its employment so far as dairy cows are concerned, and I hardly think it would be necessary to physic in the case of grazing stock. If it is deemed advisable to give any opening medicine, the purpose will be fully and efficiently met by the occasional admixture in the soft food of sulphur and treacle.

"This, of course, is with the view of lessening any attendant fever. I have not, however, found that there ever is much, the thermometer rarely rising above 102 degrees. Certainly we observe a certain amount of dulness, with staring coat and restlessness for a few days, and occasionally—not always—a slight diminution in the secretion of milk. These conditions, however, are premonitory to the occurrence of the local conditions characteristic of true inoculation, and should not be interfered with. With the decline of the process, there is a very keen appetite, abundant secretion of milk, and great tendency to thrive well.

"And now, gentlemen, I think I have said sufficient, and have occupied your time long enough for one hearing. I have left a great deal unsaid; much that I would have liked to bring before your notice, and some of it of the very greatest interest, both as regards the theory and the practice of inoculation. That must, however, be left for some future occasion, by which time I shall hope to meet some, if not all of you, as practisers of this great work, able to sustain me in the declaration which I here make, 'That in inoculation we have an agency which, if intelligently applied, is unfailing in arresting and preventing the course of pleuro-pneumonia, no matter what the conditions are under which it exists.'

"To some here, and to the profession at large, that, I dare say, will seem a

bold thing for me to say. I, however, have had abundance of opportunity of well trying conclusions on the matter, and feel myself quite justified in declaring further, "that so certain and absolutely protective is inoculation in its effects," that I feel confident that, as its practice extends, the dread of pleuro-pneumonia and the difficulty in dealing with it will become as nothing; and that our profession, in practising it, will, while benefiting themselves, largely contribute to the prosperity of their clients individually, and to the wealth and general good of the country."

Thus it will be seen that there is a weight of evidence in favour of inoculation that cannot be ignored. Scepticism in professional bodies is prone to intrude when any new idea is set on foot. A general test conducted on scientific principles is the fairest and surest way of arriving at the truth, and no pains should ever be spared when an incalculable national benefit is in the balance. Personally I am now inclined to the side of the inoculists, having so far experimented favourably.

For an interesting record of the "Pathological History of Epizootic Pleuro-pneumonia," I refer my readers to that by Dr. Charles S. Roy, commencing in the January number, 1880, of the *Veterinary Journal*.

CONSUMPTION.

Consumption, phthisis, or tuberculosis, is in England a prevalent disease amongst cattle, and is well recognised throughout the country under some one of its various appellations, as *scrofula*, *wasting*, *pining*, *grapes*, etc.

In the bovine species tubercle is remarkable for its enormous deposit and extension to parts other than the lungs.

Causes.—Hereditary predisposition,* breeding in and in, early breeding, over-breeding, climatic influence (hence the frequency of

* "*Hereditary tendency* may be divided into *direct* and *indirect*; the former when it is transmitted by a sire or dam to its immediate progeny, the latter when only transmitted to the second or third generation, constituting *alarum*."

"No predisposing cause with which we are acquainted exercises such a potent influence in the production of tubercle as this; from sire to son, from dam to offspring, from generation to generation—often in unbroken succession—the fatal tendency is transmitted; the more consanguinity is multiplied the more the tendency is increased, and the greater the virulence of the resulting products."—Walley.

the disease in imported cattle, and the same will apply to our own breeds exported to colder latitudes*), defective drainage and ventilation, long confinement and innutritious diet, debility, excessive strain on the lacteal secretion by the forcing system in dairies for the production of milk, and the long continuation of such strain—indeed, the susceptibility of heavy milkers to become 'grapy' is well known. *Physical conformation* has been also placed among the causes of tubercle. Prof. Walley observes: "Those animals which are possessed of light barrels, narrow chests, and disproportionately long legs, are undoubtedly more predisposed to tubercle than those in which conformation may be said to be perfect;" he however, very correctly proceeds to remark, "but it must not be forgotten that these physical defects are often in themselves evidences merely of stunted growth from the existence of the tubercular diathesis—mere deficiency in this respect not being of itself sufficient to engender the tendency. With physical conformation we may class colour, some authorities holding that the lighter the colour the greater the tendency to tubercle. Now, while it is, in the main, true that very light roans are liable to the disease, I have seen many strains of pure whites totally free from it; on the contrary, I have frequently seen reds succumb to it."

The character of this disease is such that a thorough knowledge of its pathology is alike essential to veterinarians, inspectors, breeders, and dairymen for the well-being of the community. (See Appendix, "Diseased Meat as an Article of Food.") It is well known that tuberculous animals will during the quiescent stage of the disease feed well, and lay on fat, and it is this condition which

* I have, especially in Alderneys, been a frequent witness of tubercle. "A cold atmosphere, and especially if it be also damp, is almost certain to induce the malady in cattle brought from a warm or mild climate. This has been observed for a long time in other than bovine animals, but Sanson and Reynal draw attention to one striking instance occurring in France. A number of the South Devon breed of cattle was imported to the experimental dairy of Saint Angeau, in Auvergne, which is situated at a high altitude: but all these, as well as their progeny (a cross with the *Auvergnettes*) were gradually swept off by phthisis, evidently induced by the unaccustomed cold, which they were incapable of resisting. So numerous were the cases of tuberculosis occurring among these animals, that local observers believed the disease to be contagious. Roll also remarks that cattle reared in mountainous districts, when transferred to low-lying, damp plains, are very liable to be affected with tuberculosis. Young animals are more predisposed than old."—Fleming's "Veterinary Sanitary Science and Police."

deceives so many persons and constitutes so sore a point with the butcher, who argues that beef so fed must be harmless; but according to Professor Walley the explanation of the latter phenomenon is simple, "as the destruction of a lung materially diminishes the process of oxidation, and thus favours the accumulation of fat."

Ancell, in his "Treatise on Tuberculosis," observes: "The fat of scrofulous subjects is described by some of the old writers as whiter, firmer, and more disposed to collect in masses than usual (Baumes). Tuberculous subjects are frequently moderately fat, particularly as children, or while young. Occasionally they are very fat. Fournet found ten such subjects, the majority of whom were females, in 192 phthisical patients. This fat is said to be defective in composition, although we have no evidence of the fact; but experience confirms the observation, that it is very readily deposited and very readily absorbed. Recent discoveries also show that the oily principle of nutrition is in some way very intimately connected with the specialty of the tuberculous habit. The tendency of the animal oil, at the temperature of the human body, to react by its elements, and pass into ulterior chemical compounds, as shown by the frequent rancidity of the oily secretions from the sebaceous glands of the skin and scalp, appears to be in relation to the foetid tendency of the alimentary excretions, and to the low vitality of the blood and of the mucous and cutaneous structures; the chemical changes being inefficiently controlled.

"The secretion of oil, and its existence in the blastema, are probably essential to the nutrition of cells."

Symptoms.—These in the earliest stages of tuberculosis are involved in more or less obscurity. The first indication of mischief usually observed is a failing appetite, a somewhat harsh coat and occasional cough, with spinal tenderness. Auscultation reveals the respiratory murmur to be louder in some places than others, and of a harsh or rushing sound. Sensitiveness is evinced on percussion, and its operation causes the animal to grunt. There is slight increase of temperature with a variable pulse. The bowels are irregular, and the lacteal secretion is deficient in quality, being blue and watery. *Nymphomania*, or sexual desire, is also frequently present. As the malady develops the cough becomes more constant and of a deeper and hoarser character. The animal sinks in flesh, the coat is harsher, and the skin fast over the ribs;

percussion on the latter with the knuckles gives pain, and the sound emitted is dull. In fact, the disease is now plainly indicated, the respiration is laboured and difficult, exertion causes considerable distress, the cough is incessant and easily induced, and is accompanied by muco-purulent expectoration. The milk still decreases in quality, and the animal presents a miserably dejected and emaciated appearance.

Following the symptoms to a still later stage, we have presented a pitiful object of existence. The poor beast is in a state of extreme debility, its emaciated frame being racked by incessant cough, followed by rusty expectoration and sometimes blood. The mouth is open and drawn back at the angles, the tongue protruded, the eyes sunken and brilliant, the flanks heaving in painful respiration; the ribs have an excessively flattened appearance, though sometimes bulged from excessive deposit of tubercle, and the shoulder-blades stand out sharp and well defined, while the abdomen is large and pendulous, and the dewlap and limbs become dropsical; frequently there is effusion. The coat under the lower jaw, termed "Wattles," is peculiarly harsh, and the skin cold, clammy, and tight. The spine is arched, and the legs gathered under the animal. The mucous membranes are pale, and the breath as death approaches becomes cadaverous and fetid. Prolonged feeble moans and grated teeth are heard from time to time. The feces are black, watery, and offensive, being occasionally passed in small hard lumps. Auscultation reveals extensive and progressive thoracic disease, the loud rasping or rushing sound has given place to a mucous rattling, sibilant and amphoric. The heart-sounds, which were tumultuous, are obscured in the masses of deposit within the lungs on either side, and attached to the pleuræ and pericardium. The pulse is very feeble and small, and life passes away much as with phthisical human beings.

"Tubercle kills," Prof. Walley observes, "1stly. By destroying the structures, and consequently the functions, of organs in which it is deposited, as the liver, lungs, kidneys, etc. 2ndly. By pressure on some important organ or vessel, producing effusion; this result is most dangerous in organs surrounded by unyielding structures, as the brain and spinal cord. 3rdly. By the degenerated tubercular products becoming absorbed, and producing purulent infection. 4thly. By small particles of tuberculous matter becoming drawn into the general circulation, and plugging

up or obliterating vessels of supply, producing, as a consequence, degeneration and atrophy of organs; but, according to M. Thaon, obliteration of vessels may be due to coagulation of blood in the vessels, or to vegetating endocarditis, though in some instances the organ may be saved from destruction by the formation of new vessels in the neighbourhood. Obliteration of the cavity of a vessel may further be produced by the pressure of larger tubercular deposits in juxtaposition to its external coats. 5thly. By appropriating the albumen of the blood for its own nourishment and depriving the system of it, thereby resembling a parasite; this is more often the case when the tubercle is situated outside organs, as in the pleura and the peritoneum. 6thly. By hæmorrhage (apoplexy); if into the brain substance, or at its base, producing pressure and organic disease, as softening; if into the bronchial tubes, asphyxia, with their attendant symptoms.

"It frequently happens that with the tuberculous growths we have independent disease of one or more organs existing, quite sufficient in extent to account for death; thus, we may have hepatitis followed by consolidation without any tubercle in the liver, or organic disease of the kidneys—producing death—with the presence of tubercle in the lungs or other organs. This is a matter of importance in a medico-legal point of view."

Post-mortem Appearances.—Post-mortem examinations of animals which have suffered from tuberculosis reveal, as a rule, an extraordinary amount of disease. The lungs, heart, pericardial and pleural membranes are, so to speak, loaded with the deposit, which, from its nodulated form, hangs to the latter like huge bunches of grapes (hence the term *grapes*), varying in size from a millet-seed to a walnut, or even larger. In some instances there is scarcely a remnant of proper lung-structure detectable, a section, to use Prof. Walley's words, "revealing large tracts of new connective (frequently indurated, sometimes semi-cartilaginous) tissue, masses of calcareous, intermingled with others of caseous, material, and, in rare instances, large quantities of fat, with occasional pigmentation of the new tissue."

Sometimes there is adhesion between the pleural membranes of the lung and the walls of the chest, and the thoracic cavity contains, when the inflammatory process has been going on, effusion, with bands or flakes of lymph, and occasionally pus.

Large masses of tuberculous deposit may also be found in the

liver, spleen, kidneys, the alimentary tract, in the glands,* particularly the mesenteric, in which case there is rapid wasting and pendulous abdomen (*Tubes mesenterica*), the generative organs,† the brain,‡ and spinal cord, the bones (see "Diseases of the Jaw"),

* See record of obscure case of "Scrofula in Calves," in which the parotid glands exhibited the first indication of disease, published by the author in the *Veterinary Journal*, 1877.

† In the *Veterinarian* for November, 1879, a case of scrofulous deposit involving the generative organs of a young short-horn cow, is recorded by Mr. John Goston, M.R.C.V.S., North Shields. The beast, which had calved six weeks previously, was reported to be suffering from strangury and bloody micturition. Despite treatment she died, and a post-mortem examination revealed the bladder, uterus and contiguous parts thickened and embedded in a hard and yellowish fatty-like mass. There was an extensive deposit of scrofulous matter on the outer wall of the vagina, its lining membrane being also much thickened and remarkably corrugated.

‡ One of the earliest records in English veterinary literature of tubercle on the brain is given by Mr. W. A. Cartwright, M.R.C.V.S., of Whitechurch, Salop, in the *Veterinarian*, April, 1844. The animal was a bull calf about nine months old. The principal symptoms were: Protruded and hanging tongue; slaverling; tottering gait; a low and debilitated appearance; blindness in the off eye, impartial vision of the other. On lifting up the head he fell down, and a fit took place. He struggled considerably. The eyes were observed to be contracted under the sides of the orbit, and a continual spasm of the muscles took place. The fit lasted five or ten minutes. He died on the thirteenth day after Mr. Cartwright saw him.

Post-mortem examination by Mr. C.—"I removed a portion of the skull and cervical vertebrae in order to examine the brain. The dura mater had a very vascular appearance. After removing the dura mater and separating the nervous connections of the brain, I cut the medulla oblongata across, when an ounce or two of serum escaped. I found that the pia mater contained a great number of softish granular tubercles on it. I took the brain home with me, and examined it more carefully. On raising and separating the pia mater from the brain, I found that the tubercles existed in a great measure on that membrane, on the sides and base of the cerebrum and cerebellum and medulla oblongata, and also deep within the convolutions of the cerebrum and cerebellum. A few were found on the other parts of the membrane. The tubercles appeared to be growing from the external surface of the pia mater, or tunica arachnoidis, and projected against and indented the surface of the brain. They were in size from a pin's point to a pin's head, and almost in close contact with each other on the membrane, and of a yellowish colour. The pia mater was very vascular where the tubercles were situated, and bloodvessels could be traced to them. There were no tubercles within the lateral ventricles, and but little serum. The tubercles were very numerous about the superior part of the base of the cerebrum and the cerebellum. The membranes covering the medulla oblongata were considerably thickened with lymph and tubercles. The spinal marrow was not examined." Tuberculous deposit was also found in the lungs on the pleura, the axillary glands, and abdominal viscera.

and joints, and occasionally in the muscles and bloodvessels. I recorded a singular case of the latter in 1876, which will be found published in the *Veterinary Journal* for that year as follows:

"On Saturday, the 25th September, I was requested by J. C. Major, Esq., of the Bhylls, to visit a cow which for some time had been ailing or falling off. I found the animal down, exceedingly emaciated, and unable to rise—at least, the united efforts of a youth and myself failed to make her stand, though he observed she could if she liked. Her pulse was slow and feeble, breathing a little hurried, horns and ears hot, and the extremities moderately warm. As Mr. Major and his bailiff were away from home, I left a diffusible stimulant, and called again on the following Monday, when I found her still lying and unwilling to rise. With the aid of several men she was lifted up, and I then discovered she was very lame in the near hind limb, and in attempting to move exhibited great pain. The stifle was considerably enlarged, also the point of the hip, and it was stated she never lay on that side. Her fore limbs above the knees were also swollen and sore.

"I was informed that her time for calving was the 4th of September, but that she had 'slipped' her calf when five months gone, and since then had gradually wasted. She had been observed to be lame at intervals; in other respects she had appeared to her attendants to be healthy, *i.e.*, so far as retaining her appetite, chewing her cud, etc., went.

"I diagnosed it to be a case of scrofula, and considering her emaciated condition, and the time she had been ailing, together with her pain and lameness, I advised Mr. Major to have her destroyed. This was done the following morning.

"A post-mortem examination revealed tuberculous deposit in the portion of lung sent you; the remainder was free. On separating the heart from its attachments, I noticed an oval hard substance proceeding from the right auricle, which on further examination proved to be the anterior vena cava distended by some hard internal body. It was divided longitudinally, and within it, scarcely half an inch before it opens into the auricle, was a tumour the size of a hen's egg; its capsule, which was attached to nearly two-thirds of the circumference of the vena cava, was thick and brittle, and retained its shell-like form when emptied; the walls of the vena cava at that part, you will observe, are considerably thickened and cartilaginous in nature. I have preserved the specimen as much as possible for your inspection, by replacing some of the escaped matter, and enclosing the divided parts with stitches. With such a limited space for the passage of blood at this important situation, and in a vessel of such magnitude, which has to return the blood from one-half of the body, and that the most vital half, it

"This calf, among many others, had been hoosing for some time, but he was thought to be getting better of that complaint, and nothing more was considered to be ailing him until he was seen hanging his tongue out. It is a fact that this calf came out of a fine short-horned cow that died on the 26th of May previous of tubercles in her lungs, and on the pleura and peritoneum (which I examined after death)—in short, of phthisis. This calf was not allowed to suck his dam for above a fortnight or three weeks, but was put on another cow, and remained there for some months."

is a marvel the animal existed so long. Whether the substance would have eventually broken down and given rise to similar deposits elsewhere, or by increasing in size have completely blocked up the vessel, and caused death, is a matter for speculation. I am inclined to think the latter would have been the *finale*. On examining the heart, I found the valves at the auriculo-ventricular openings diseased, particularly the tricuspid, on which was deposited scrofulous matter similar to that found in the vena cava; but beyond opening the right auricle, I left the organ entire for your better inspection. The remaining viscera, excepting the portion of lung, exhibited no signs of disease. On external examination of the body with reference to the lameness, I found a large accumulation of pus in the stifle joint, with scrofulous degeneration of the surrounding tissues, and the same condition without pus at the point of the hip. The muscles and tendons above the knees were enlarged and dark in colour.

"I should much like to know if any of your numerous readers have, in the course of their experience amongst scrofulous cattle, met with a similar condition of this important bloodvessel.

"PROFESSOR DUGUID COURTEOUSLY FURNISHES THE FOLLOWING NOTES ON THE PARTS FORWARDED BY ME :

"Tumours of bloodvessels are very rare, and the specimen sent by Mr. Hill proves a most interesting one on account of

- "1. Its situation and size;
- "2. Its structure and mode of growth; and
- "3. Portions of the tumour undergoing retrograde change and breaking up.

"Situated in the canal of the anterior vena cava, about half an inch from the auricle, extending along the wall of the vessel for a distance of three and a half inches, and measuring two and a quarter inches at its thickest part, the tumour must have proved a very serious obstruction to the flow of blood where no collateral circulation could be established to compensate for the diminished calibre of this important vessel. The tumour, when examined microscopically, was found to consist of dense interlacing bundles of unstriped muscle, and had evidently grown from without; that is to say, from the muscular coat of the vessel; it had pressed inward the internal coat which, thickened and altered in structure, still covered it. This was clearly shown by the fact that along the borders, and spreading on to the surface of the tumour for about one-eighth of an inch, the internal coat of the vein was healthy. The capsule of the tumour, referred to by Mr. Hill as thick and brittle, consisted of the altered and diseased portion of the internal coat, which had been subjected to the greatest amount of pressure.

"A mass of granular material of variable thickness, and at some points extending deeply into the structure of the tumour, showed that the tissue was breaking up in what appeared to be the oldest part of the new growth. The deposits on the tricuspid valve were loosely attached to the surface, and could be easily removed, leaving no trace of infiltration of the tissues of the valve; they appeared to consist of the detached portions of the flaky and brittle internal lining of the vena cava, held together by fibrinous coagula.

"The portion of lung referred to contained several masses of caseous deposit, around some of which pus was formed."

The bodies or deposits noticed in the post mortem examinations of scrofulous animals are each individual tubercles, and not, as sometimes supposed, one product. They also vary considerably in character, and this, with their appearance and position, is well set forth in Mr. Fleming's work on "Sanitary Science and Police."*

• "The enormous masses of tubercular matter so often met with are not composed of only one tubercle—for we have said that this is always limited in its volume—but of multitudes; around, the primary miliary nodule are soon formed others which acquire the same volume; these are surrounded, again, by those of more recent growth, and so on incessantly until the end; so that each mass or aggregation of tubercles, nodulated and everywhere added to by new productions, increases indefinitely, and at last may weigh several pounds.

"The tubercles so developed undergo successive modifications, which so alter their character, that many observers have denied their identity. The first of these alterations, which occurs in certain conditions, is 'calcification, or impregnation of the tissue with earthy matter. This may be general or partial, and may exist in various degrees in the same mass.

"The calcified tubercle has usually attained its maximum size—from that of a hemp-seed to a small pea; it is yellowish-white, perfectly opaque, very hard, and feels like a little stone in the tissues; it is crushed with difficulty, and then appears to be a mass of chalk, and it grates under the knife when an attempt is made to cut it.

"When divided, the section shows a central portion—the most considerable, but irregularly defined, and quite petrified—and an external yet fibrous in its nature. This appearance doubtless led casual observers to believe that the tubercle was enkysted; but the enucleation supposed to have taken place on pressure was the only result of rupture of the abnormal tissue surrounding the infiltrated portion.

"At this stage the tubercles are never isolated, but are collected in various-sized masses which are fixed in the intermediate connective tissue supporting the capillaries. The earthy matter would appear to be composed of two calcareous salts; and after its disintegration by acetic and hydrochloric acids, there remains the *debris* of the cells already described, and especially the oval nuclei, the majority of which are intact.

"This calcification appears to commence in the cells; as in those which are undergoing the transformation there is seen a portion—particularly around the nucleus—which is quite opaque, and the addition of the hydrochloric acid causes a slight effervescence, the disappearance of the opacity, and the appearance of the nuclei. It is not improbable that the calcification may also take place in the intermediate connective tissue.

"Another modification in the tubercle is 'softening,' which occurs whether calcification has or has not taken place, and consists in a granulo-adipose degeneration (the 'necrobiosis' of Virchow) which terminates in caseous softening (*ramollissement caséux*). This alteration commences at the centre and extends towards the circumference of the tubercle, until there remains nothing but the surrounding connective tissue; and its appearance would leave superficial examiners to think it was enkysted, as

Contagium.—The infectiveness or contagiousness of tuberculosis has received much attention, and it has been over and over again

it forms a badly-defined cavity, the contents of which are easily detached. Sometimes several contiguous tubercles break up simultaneously, and the septa between them disappear, leaving cavities sometimes larger than a walnut. These vomicae are of various shapes and dimensions, and are often confounded with other cavities which are formed in a very different manner.

"The vomicae have no proper walls, but are merely surrounded by the more or less indurated connective tissue that constitutes the stroma of the tubercular masses, and their interior is not vascular like that of cavities resulting from inflammation. There is no natural demarcation between them and their contents, as in kysts and abscesses, the gradation being insensible. The central matter is more or less coherent, according to the degrees of softening at which it has arrived; it is white and plaster-like, if calcification has already occurred, and has a grayish-yellow colour and cheesy consistency in the contrary case. It is this cretaceous or pyoid detritus which was formerly improperly designated 'tubercular matter.' It has really no special characteristics, and resembles the contents of any kind of chronic tumour or indurated abscess after the total absorption of the fluid portion of the pus, or that of an atheroma.

"Histologically, this softened matter of the tubercle has a different appearance, according as it is mixed or not with calcareous particles. In the former case, with the earthy matter are seen fat granules, but these are alone to be found when calcification has not preceded softening. They are very small, gray in outline, and transparent in the centre: resisting the action of acetic acid, and only soluble in ether. They are isolated or in clusters. The process of degeneration is exactly that which occurs in all pathological tissues that cannot be absorbed or destroyed by suppuration.

"With regard to the situation of the tubercles, we have stated that all the serous membranes are liable to be their seat; though all are not equally disposed. The pleura is always affected, the peritoneum frequently, and the other serous membranes rarely. Those of the pleura always commence in the texture of that membrane; they are extremely fine at first, but they increase in size and multiply, coalesce, and finally form smooth masses covered on their free surface by epithelium. In shape they are sometimes tuberos and mammillated; or like clusters of grapes, more or less confounded at their base, or completely separated, and suspended, as it were, by vascular peduncles, giving the membrane a most diversified appearance. At other times, all the free surface of the two layers is studded with round tumours, formed by one or a multitude of tubercles, varying from the size of a pea to that of an apple (hence the popular designations of *pommelette* in France, 'angle-berries' in Scotland, and *Pertucht* in Germany). Not unfrequently, those on the visceral layer are joined to the vegetations on the parietal surface, so that the lung is really attached to the ribs by adhesions of a more or less rigid character, according to the duration of the disease. These pleural tumours are not unfrequently so large that they weigh twelve or fifteen pounds, and may exist in the three states just described; the new tubercles being external, the cretaceous in the middle zone, and those which are undergoing softening in the interior of the mass.

experimentally proved that it can be transmitted to other animals both by inoculation and ingestion. Notable amongst those who have put it to the test are Villemin, Chauveau Klebs, Gerlach,*

The pleura itself is thickened, indurated, and much more vascular than in health.

"We have described the situation of the tubercles in the lungs; in the advanced stages, the greater portion of the agglomerated masses they form may be calcified or cretified by layers, and softened in other parts to form *ramicæ* of various sizes, containing the detritus already alluded to. These *ramicæ*, according to Trusbot, appear to be closed, and have no communication with the bronchi or pleural sacs.

"In the bronchial lymphatic glands, the tubercles are never absent; they are sometimes seen in those at the entrance to the chest, and more frequently in those of the mesentery and sublumbar region.

"In the bronchial glands they in some cases attained enormous dimensions; some measuring a foot in length, and weighing about eight pounds, after having been carefully dissected away from the neighbouring organs. They commence to be formed in the connective tissue surrounding the glands, and, by their growth and multiplication they push these on one side; but the glands are never affected. This peculiarity would appear to establish a marked difference between tuberculosis in the ox and the human species; as, in the latter the deposit takes place in the texture of the lymphatic glands, and in the midst of the normal cells.

"Tubercles are frequently discovered in the liver and spleen; though they are never numerous, nor in large masses, and offer nothing worthy of note. In the kidneys and other glands they also appear; and it would seem that the muscles and bones are seldom affected. Muscular tuberculosis is now and again witnessed. The mucous membrane of the intestines and uterus, as well as the udder, are often involved.

"We have noticed some of the contingent lesions, which are often confounded with those we have considered as essential. They are generally acute (rare) or chronic pleurisy; chronic bronchitis, with cavities formed by the mucous membrane which has been forced into the connective tissue of the lungs; lobular pneumonia, with caseous infiltrations, abscesses opening into the pleural cavities or remaining closed; and after the inflammation, induration and gangrenous cavities or sequestra of the lung tissue; with perhaps enteritis towards the termination of the disease.

"The muscles are pale, soft, and flabby-looking, and the blood poor in quality."

* Gerlach, of Berlin, in a recent communication to Zundel, of Strasburg, thus details the results of his researches:—"1. The tuberculosis of cattle is very infectious. 2. The tubercles covering the serous membranes, as well as those in the other organs, are as infective, and produce the same tubercles as the tuberculous matter of the lungs: the identity of the pulmonary phthisis of cattle and general tuberculosis cannot be doubted. 3. Infection can be produced after inoculation, as well as after ingestion, of the tubercular matter. 4. The flesh of animals affected with tuberculosis possesses, in certain circumstances, the power of infecting, though to a less degree than the tubercular matter. 5. The temperature of boiling water destroys

Harms, Ganthur, Leisering, Zurn, Saint-Cyr, Bagge, and others. In the case of obscure scrofula in calves—already referred to—from the deposit in the parotid gland of the one I inoculated a kitten in the forearm and thigh. An enlargement the size of a pigeon's egg formed on the arm, and discharged a thick ichorous matter; the creature became extremely emaciated, but for some time fed well. He refused, however, to play with his companions, continually slept, and breathed short.

On the thirty-fifth day I destroyed the kitten, and found the following conditions on making a post-mortem examination:

In both lungs tubercle was thickly deposited. The liver was studded with it here and there. The spleen was loaded with it in the form of shot-like eminences externally. The mesenteric glands were enlarged and inflamed.

Three medical men in Wolverhampton, and Dr. Burdon Sanderson of London, inspected the body.

It may be objected that possibly the kitten had tubercle previous to the inoculation; but of this I am convinced to the contrary, as I selected the strongest and healthiest-looking of the litter, and without the slightest sign of disease.

Again, it may be said that the same condition would result from any blood-poisoning. Not so; for here we have an identical reproduction of the heifer's malady—to wit, scrofula—and in a marvellously short period, being only five weeks between inoculation and death, when, to judge from the appearances, the deposit had been present in the part for some time.

Very recently in making a post-mortem examination of a cow sent for sale to the Wolverhampton cattle market, and which,

the infective principle: though boiled tubercles, nevertheless, often preserve a certain degree of virulence. It is in this as in trichinosis. Although the temperature of boiling water, or even a lower temperature, destroys the parasites, yet there may be found in the centre of the boiled flesh living trichinæ: muscle being, in general, a bad conductor of heat, and the high temperature only reaching its interior after some time. In some experiments it will be found that tubercles an inch in diameter will, after half an hour's boiling, still possess infective properties, though these are of course diminished.

"Gerlach's experiments have been, and are now being, carried on with all kinds of animals, and particularly with cooked and uncooked milk; and he asserts that the infectious properties of this fluid can no longer be denied"—Fleming's "Sanitary Science and Police."

owing to the advanced state of tuberculosis and fearful emaciation, was slaughtered pending a charge of cruelty for driving in that state, I found not only extensive disease throughout nearly the whole viscera, but tuberculosis deposit within the mammary gland, and at the upper portion of the teats *within the milk duct*, and in such a condition as to be easily broken up in the act of milking. An analysis of the milk showed it deficient in fat properties, whilst the microscope revealed innumerable pus globules. Such a case as this proves the vital importance of dairy inspection.

Prevention.—Preventive measures consist in attention to hygiene, as good food, pure water, fresh air, exercise, ventilation, cleanliness, etc. In fact any disposal to disease, anything that diminishes vitality, or places the creative powers at a low ebb, are to be avoided. For instance, as Dr. Chambers observes: "Anæmia may so lower the creative power of the blood, that instead of the body being built up of elastic and highly vitalised fibrin, it has to put up with a cheesy, brittle substance called tubercle. This is just the sort of fraud a rascally contractor commits when he lays your floors on half-seasoned timbers. Your house is destroyed by dry rot; and the lungs in which tubercle has been substituted for healthy connective tissue gradually soften and break up. The most effectual remedy in both instances is to look after the builders, to secure the honesty of the one and the vitality of the other as far as possible."

Treatment.—So far as the prolongation of life and the alleviation of suffering are concerned, remedial measures may be adopted; but as for any hope of a cure, that should at once be dismissed from the mind. In the treatment of tuberculosis, it must be remembered that we have a reparative or building-up process to follow out. We have to checkmate the devastations of the enemy—to strengthen the creative power of the blood. The sulphate of iron, from 2 to 4 drachms twice daily in good sound old ale; cod-liver or linseed oil, $\frac{1}{2}$ pint twice or three times a week, and nutritious and fat-forming food, are the agents indicated.

Counter-irritation in the acute stage is of especial benefit, either by the application of mustard, ammonia, or turpentine embrocation to the sides, or the insertion of setons; personally, I prefer the latter. It is hardly necessary to add, the subject should be kept moderately warm and dry.

HOOSE.

Hoose, hoost, or husk, is a very common and fatal disease due to the presence of a parasite (*Strongylus micrurus*) in the trachea and bronchial tubes, and is chiefly met with in young stock. (See 'Internal Parasites.')

Symptoms.—Considerable irritation of the air-passages manifested by frequent husking, or attempts to dislodge some annoyance. The animal soon becomes emaciated and dies generally from asphyxia.

A post-mortem examination often reveals myriads of these worms, like short lengths of cotton, or in some instances entwined together in a ball.

Treatment.—My own experience is entirely in favour of the inhalation of chlorine gas, which I have used most successfully. Medicinally I prescribe small doses of turpentine and linseed-oil.

The system requires good support; the diet should therefore be generous and nutritious. Tonics should follow the expulsion or destruction of the parasites, or in urgent cases may be given earlier. The preparations of iron and bark are most suitable.

POLYPUS.

Polypus in the nose is rarely seen in cattle. Youatt observes: "We have only seen one case of it; and that might have been said to be more polypus in the pharynx than in the nasal cavity, had not its pedicle been traced into that cavity, and seemingly attached to the upper part of the inferior turbinated bone. A cow was anxious to eat, and was otherwise in good health; but occasionally she was unable to swallow, and the pellet was returned with an effort resembling vomiting. This increased until she was scarcely able to eat, and was rapidly losing flesh. The case indicated some disease of the back part of the mouth, or the commencement of the gullet; and we caused one of the pieces of wood through which the tube of the stomach-pump is passed into the mouth to be made with an aperture sufficiently large for the hand to go through. The cow was secured and the mouth-piece fixed, and the hand passed into the fauces, when a round body, movable and attached by a cord, was felt—an evident polypus, the pedicle of

which could be traced upwards and forwards into the cavity of the nose, but the termination of which could not be reached. It was seized with a pair of strong forceps with deeply roughened blades, and attempted to be removed by *torsion*, i.e., by twisting it round and round until it broke. At the third turn the pedicle gave way, and a polypus nearly half a pound in weight was brought out. Polypi should be removed by a ligature round a pedicle, and as near to the root as possible, or by torsion, and by the former whenever it can be effected."

Synptoms.—The presence of polypus in the nasal chambers usually gives rise to frequent sneezing, a stuffy condition of breathing, and discharge. Sometimes the animal snores.

OZÆNA.

Ozæna, commonly called nasal gleet, is seldom met with in cattle. The disease consists of a copious and fetid discharge from one or both nostrils.

Causes.—Prolonged catarrh, irritation from the presence of substances in the nasal chambers or frontal sinuses, ulceration of the Schneiderian membrane, disease of the turbinated bones, unsound teeth.

Synptoms.—Nasal discharge, as already described, which may be continuous or periodical; the breathing is more or less obstructed and has a rattling sound from the ingress and egress of air through the said discharge; frequent sneezing and occasional cough.

Treatment.—The nostrils should be daily syringed with warm water, and where there is ulceration or diseased bone, either of the following lotions may be injected:

- | | |
|---------------------------|-----------|
| 1. Alum | 1 drachm. |
| Aqua | 6 ounces. |
| 2. Zinc Chloride | 1 drachm. |
| Aqua | 6 ounces. |
| 3. Nitrate of Silver..... | 1 drachm. |
| Aqua | 6 ounces. |

The second recipe, where there is fœtor, is most useful.

If the disease proceeds from a diseased tooth, removal will be at once necessary. If from polypus, the same course must be adopted.

Mineral tonics and generous diet are essential adjuncts to the treatment.

CHAPTER III.

DISEASES OF THE HEART AND ITS MEMBRANES.

Palpitation.—Carditis.—Hypertrophy.—Atrophy.—Dilatation.—Tumours.—Cyanosis.—Rupture.—Ossification.—Fatty Degeneration.—Ectopia Cordis.—Pericarditis.—Endocarditis.—Wounds.

IN veterinary literature the subject of Heart Diseases occupies a very meagre portion. This may probably arise from doubting the possibility of diagnosing them. At all events, considering the vast importance of such a subject, and the necessity for making one's self acquainted with their nature, inasmuch as the various diseases heading this chapter frequently exist in cattle, and are to a very great extent only ascertained after death, I may be excused if from time to time I apply the remarks made on certain of these diseases in human pathology to that of the ox.

The heart itself, the centre of circulation, is described as a hollow muscle or sac composed of muscular walls. It is divided by a thick septum into two compartments or pouches. "Of these two contractile pouches, one, placed on the track of the dark blood, propels it into the lungs; the other, situated on the course of the red blood, distributes it to all parts of the body.

"Each of these is subdivided into two superposed compartments by a circular constriction, at which is a membranous valve that at certain fixed periods is elevated, and then forms a complete horizontal partition extended between the two compartments.

"The superior compartment receives the convergent or centripetal portion of the blood-canal—that is, the veins; it is named the *auricle*. The inferior gives origin to the divergent or centrifugal part of the same canal, and is designated the *ventricle*.

"The cavities of the heart are distinguished into *right* or *anterior*, and *left* or *posterior*, because of their relative positions. There are, then, a *right auricle* and *ventricle*, the two dark-blood pouches;

and a *left auricle and ventricle*, situated on the track of the red-blooded canal.

"Form and Direction.—The heart presents the form of an inverted cone slightly depressed on each side, and whose axis, directed obliquely downwards and backwards, deviates a little to the right at its superior extremity."*—Chauveau.*

Again, it must not be forgotten that the heart of the ox differs somewhat anatomically from that organ in other of the lower animals and man. For instance: "In the ox two small bones, named *bones of the heart*, are found in the substance of the aortic zone. The largest is in the right side, at the point where the arterial ring is approximated to the auriculo-ventricular zones; the other, situated in the left, is perhaps not constantly present. The first is triangular in shape, curved to the right, and its base directed



Fig. 8.—Bone of the Ox's Heart natural size: 1, the anterior angle; 2,2, the posterior angles; 3, the upper border; 4, the lower border; 5, the posterior border; 6, the right surface.—*Leigh.*

upwards. The right face lies against the auriculo-ventricular opening; the left is covered by the walls of the aorta at its commencement. It is about an inch in length. The ox's heart averages from about $3\frac{1}{2}$ to $4\frac{1}{2}$ lb. It is more elongated and pointed in ruminants than in the horse or pig. The *large* bone in the ox's heart is elongated from before to behind, flattened laterally and curved to the left; its surface is roughened; and its length is sometimes about two inches. The left or *small* bone is usually flattened on each side and triangular, one of its points is directed forward, another backward, and a third inferiorly; its length is about three-quarters of an inch when fully developed."*—Chauveau.*

External conformation of the Heart.—I here merely beg to offer the reader the subjoined illustrations (pp. 66, 67) with their description, and for a general anatomical review I refer him to Mr. Fleming's translation of Chauveau's work, from which they are taken.

PALPITATION.

Palpitation, or nervous and tumultuous movements of the heart, is from time to time met with in the ox.

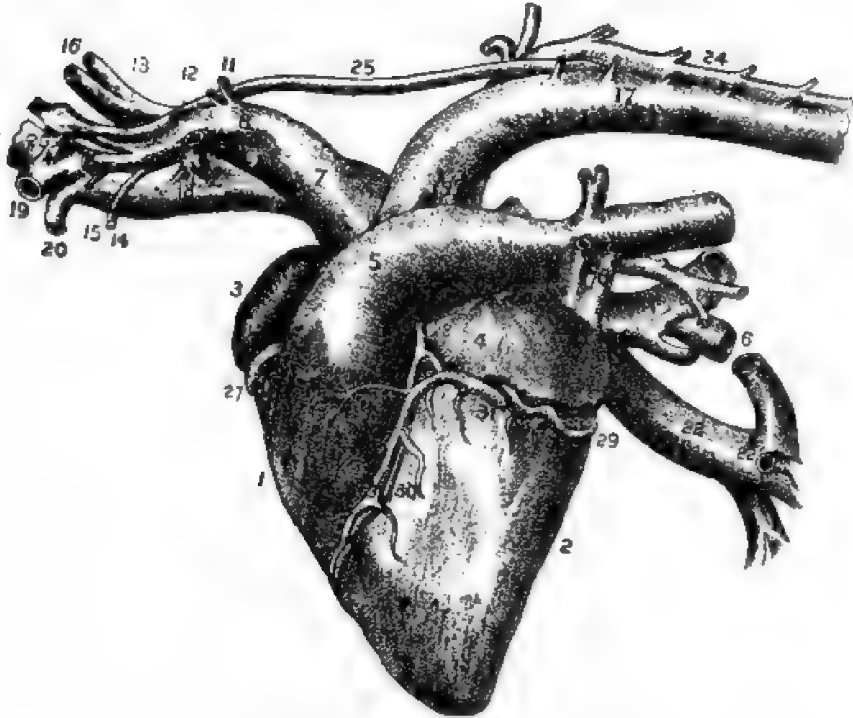


Fig. 9.—The Heart and principal vessels ; left face description. 1, Right ventricle ; 2, Left ventricle ; 3, Right auricle ; 4, Left auricle ; 5, Pulmonary artery ; 5', Obliterated arterial canal ; 6, Pulmonary veins ; 7, Anterior aorta ; 8, Left axillary artery ; 9, Right axillary artery, or brachio-cephalic trunk ; 10, Origin of the dorsal artery ; 11, Origin of the superior cervical artery ; 12, Origin of the vertebral artery ; 13, Origin of the inferior cervical artery ; 14, Origin of the internal thoracic artery ; 15, Origin of the external thoracic artery ; 16, Carotid arteries ; 17, Posterior aorta ; 18, Anterior vena cava ; 19, Trunk of the axillary vein ; 20, Trunk of the internal thoracic vein ; 21, Trunk of the dorso-cervical vein ; 22, Posterior vena cava ; 23, Embouchure of the hepatic and diaphragmatic veins ; 24, Vena azygos ; 25, Thoracic duct ; 26, Embouchure of that vessel, placed near the origin of the anterior vena cava ; 27, Right cardiac artery ; 28, Left cardiac artery ; 29, Auriculo-ventricular branch of the latter ; 30, Its ventricular branch ; 31, Cardiac vein.—*Chauveau.*

Causes: Predisposing.—A nervous temperament, debility.

Exciting.—Sudden fright, rage, violent exercise, hæmorrhage, anæmia, plethora.

Symptoms.—The severity of palpitation may be to a great extent ascertained by auscultation and by placing the flat hand over the cardiac region. In the former a dull thumping noise is heard, which is frequently audible at a considerable distance from the



Fig. 10.—The Heart and principal vessels; right face description. 1, Right ventricle; 2, Left ventricle; 3, Right auricle; 4, Anterior vena cava; 5, Vena azygos; 6, Posterior vena cava; 7, 7, Pulmonary veins; 8, 8, Divisions of the pulmonary artery; 9, Posterior aorta; 10, Anterior aorta; 11, Thoracic duct; 12, Right Cardiac artery; 13, Its vertical or ventricular branch; 14, Its horizontal or auriculo-ventricular branch; 15, Ventricular branch of the cardiac vein; 16, Auriculo-ventricular branch of the same.—*Chauveau*.

animal. In the latter, the movement gives to the hand a jerk of more or less strength. There is also heaving at the flanks, dilata-

tion of the nostrils, a peculiar distressed nervous or anxious appearance on the face. In many cases the submaxillary pulse is indistinct; in others, intermittent.

"Anæmic palpitation is associated with *blood-sounds* heard in the vicinity of the heart, large arteries, and veins. They vary with the condition of the blood, and are dependent on the quality of the latter.

"Physicians have termed 'anæmic murmurs' the peculiar sounds heard most distinctly in the lower animals, and due to the churning sustained by the blood in passing through channels of varying size as it traverses the heart. There is a venous blood-sound heard by applying the ear over the jugular veins at the root of the neck in anæmia. It is a continuous hum, to which the French have applied the term of *bruit de diable*."—*Gamgee*.

On the differential symptoms in the human subject of palpitation due to organic disease of the heart, and of that arising independent of organic disease, the following table is given (Bellingham, l. c. p. 172):

Palpitation Depending upon Organic Disease of the Heart.

1. More common in the male than the female.
2. Palpitation usually comes on slowly and gradually.
3. Palpitation constant, though more marked at one period than at another.
4. Impulse usually stronger than natural: sometimes remarkably increased, heaving, and prolonged; at others, irregular and unequal.
5. Percussion elicits a dull sound over an increased surface, and the degree of dullness is greater than natural.
6. Palpitation often accompanied by the auscultatory signs of diseased valves.
7. Rhythm of the heart regular, irregular, or intermittent; its action not necessarily quickened.
8. Palpitation often not much complained of by the patient, occa-

Palpitation Independent of Organic Disease of the Heart.

1. More common in the female than the male.
2. Palpitation usually sets in suddenly.
3. Palpitation not constant, having frequent intermissions.
4. Impulse neither heaving nor prolonged; often abrupt, knocking, and circumscribed, and accompanied by a fluttering sensation in the præcordial region or epigastrium.
5. Extent of surface in the region of the heart, which yields naturally a dull sound on percussion, not increased.
6. Auscultatory signs of diseased valves absent; *bruit de soufflet* often present in large arteries, and a continuous murmur in the veins.
7. Rhythm of heart usually regular, sometimes intermittent; its action generally more rapid than natural.
8. Palpitation often much complained of by the patient; readily

sionally attended by severe pain, extending to the left shoulder and arm.

9. Lips and cheeks often livid; countenance congested; anasarca of the lower extremities common.

10. Palpitation increased by exercise, by stimulants and tonics, etc.; relieved by rest, and frequently, also, by local or general bleeding, and an antiphlogistic regimen.

induced by mental emotion, and frequently accompanied by pain in the left side.

9. Lips and cheek never livid; countenance often chlorotic; anasarca absent, except in extreme cases.

10. Palpitation increased by sedentary occupations; by local and general bleedings, etc.; relieved by moderate exercise, and by stimulants or tonics, particularly the preparations of iron.

CARDITIS.

Carditis, or inflammation of the heart, rarely exists independently; it is more generally associated with *pericarditis* or *endocarditis*, or both. When, however, carditis alone is present, the inflammation is seldom diffused, but is confined to one or two spots in which an ulcerative or suppurative process will frequently be found to have been established. This is more observable when the organ has been punctured.

Symptoms.—During life there is nothing to guide the practitioner to a correct diagnosis. The pulse, as in other inflammatory affections, may be accelerated and hard, and it may be irregular. Pain is usually manifested, and sighing is not unfrequent. There is a disinclination to move, and the breathing is usually abdominal. But inasmuch as like symptoms accompany other affections, no surety can be placed in them.

Treatment.—This, so far as it could be adopted, would chiefly consist in perfect quietude. Counter-irritation might be applied to the left side. Medicinal agents, except for the purpose of preventing constipation and its attendant danger in straining, are comparatively useless.

HYPERTROPHY OF THE HEART.

Hypertrophy, or increase in the size of the heart and thickness of its walls, with enlargement or diminution of its cavities, is by no means an uncommon disease in cattle.

There are three species of hypertrophy :

1. Simple hypertrophy, where the walls alone are thickened.
2. Eccentric hypertrophy, where in addition to the walls being thickened, there is dilatation of the cavities.
3. Concentric hypertrophy, where there is contraction of the cavities, with the thickened walls.

Causes.—Long travel; undue exertion (in working oxen); violent straining (in working oxen); plethora; pericardial or endocardial disease and chronic lung affections; venous and arterial obstructions.

Symptoms.—In simple hypertrophy the pulse is strong and regular, and the sounds of the heart are distinct and intense, its thumping being frequently observed at a distance. In eccentric hypertrophy the pulse is full, and easily compressible, and the sounds of the heart are louder and remarkably distinct. In concentric hypertrophy the pulse is small and hard, and the heart-sounds are nearly inaudible.

Percussion in the cardiac region yields a greater extent of dead sound, varying, of course, with the amount of hypertrophy. Swelling of the jugular veins, with simultaneous pulsation of the carotids, has been laid down in human pathology as symptomatic of hypertrophy of the right ventricle. I have not observed this phenomenon in the lower animals, probably from the different position of the circulatory system.

Treatment.—The treatment of hypertrophy of the heart is not satisfactory. Quietude should be strictly observed, with proper attention to the digestive organs. Constipation must be avoided. The diet should consist of light and laxative food. Medicinally, tonics may be given. Professor Williams suggests chlorate of potash; but from a pecuniary point of view, if the animal is in fair condition, slaughter is most advisable. In chronic cases strong counter-irritation over the region of the heart is beneficial.

ATROPHY OF THE HEART.

Atrophy, or wasting of the muscular substance of the heart, is a rare disease in cattle, though not unfrequent in the horse.

Causes.—These may be local or general. The local ones are those that directly interfere with the functions of the heart—as pericardial effusion, in which case it is not unusual to find the heart pale and wasted,* or they may arise from disease of the arteries and circulatory obstruction. The general causes are those which arise from such constitutional conditions as impair the general nutrition; notably, anæmia, phthisis, cancer, etc.

Symptoms.—A small feeble pulse, except when dilution exists, when it is full and soft; indistinct heart-sounds, and but little dullness in percussion. The animal is usually languid, has little or no appetite, and the extremities are cold.

Treatment.—Mineral tonics, a generous diet, and quietude, comprise the remedial measures; but, as in the former disease, these in cattle are not satisfactory.

DILATATION OF THE HEART.

Dilatation of the cavities and orifices of the heart may or may not be accompanied by hypertrophy, and one or both sides may be implicated.

Causes.—Valvular disease, concretions, or any impediment to the flow of blood. "The cavities of the heart, like all hollow

* In the post-mortem examination of a recent and very protracted case of sporadic pleuro-pneumonia in a large heifer which came under my care, the heart barely weighed three pounds; it was very pale, flabby, shrunken, and collapsed immediately it was removed. Several bucketsful of serous effusion ran from the chest, but there was little in the pericardium; the valves were thickened, and the endocardial membrane was inflamed.

organs, dilate when there is any impediment to the course of the blood or other fluid which is to pass through them. Thus, in bad stricture of the urethra, the bladder enlarges; in contraction of the pylorus the stomach enlarges; and in stricture of the intestine, the tube increases in size above the obstruction. In the same manner, if the valves of the heart are diseased and offer obstruction to the passage of the blood, the cavity above them becomes enlarged as the accumulation of blood distends its parietes. It is also important to state that the auricles more readily dilate than the ventricles, and the right ventricle more readily than the left. The auricle is distended when the auriculo-ventricular opening is contracted, and the ventricle when the arterial valves are affected. But it often happens, on account of the difference of resistance in the different cavities of the heart, that the cavity nearest to the obstacle is not always the first which is dilated. Thus, when the aortic valves are diseased, the left auricle is often dilated before the left ventricle. It is also to be remembered that the different cavities of the heart, which are closely connected with each other, are often dilated by any great obstacle to the course of the blood through them. Besides the mechanical force, the blood possesses an excitant and irritant power, in consequence of which the nutrition of the heart becomes frequently increased, so that the same cause of obstruction to the circulation will not only induce dilatation, but hypertrophy.

"But if hypertrophy does not ensue, the contractility of the heart will be more easily overcome by the dilating power, and the circulation will be greatly diminished and impeded. Hypertrophy is not a constant complication with dilatation of the heart, and in many cases the dilated parietes are thinned; and to this disease the term passive aneurism was applied by Corvisart."

Hooper.

Symptoms.—In some instances the pulse is full, soft, and easily compressible. In others it is feeble and irregular. The extremities, especially those furthest removed from the centre of circulation, are exceedingly cold. The heart-sounds are weak and tremulous. The animal is listless, and has a depressed appearance. The mucous membranes are pallid, and not unfrequently there is a dry cough. As the disease progresses the limbs and dewlap become dropsical, the patient loses flesh, the general functions are imper-

fectly performed, occasionally delirium is manifested, and eventually death from coma takes place.

Treatment, excepting quietude, is of no avail.

TUMOURS OF THE HEART.

The heart of the ox is not unfrequently the seat of morbid growths.

"There is a great variety of cardiac tumours. Those that I have more frequently witnessed are : 1. Parasitic growths, either internally situated or attached to the apex of the heart ; 2. Melanotic tumours in the substance of the heart ; 3. Fibrinous tumours, or cardiac polypi, properly so called ; 4. Vascular tumours ; 5. Cancer.

"It is evident that the importance of these organic disorders varies as much from the position of the growth as from its size and tendency to interfere with the heart's action. The presence of a small obstruction within the heart is calculated to endanger an animal's life far more than an external tumour. Thus, a polypus forming within the auricle may drop on the corresponding auriculo-ventricular opening and arrest the blood's flow. It is remarkable that, as shown by Case II. reported below, a large polypus may have its pedicle in the auricle, and continue growing in the ventricle to the extent of filling the latter ; and yet the animal died suddenly *without having previously shown signs of ill health*. I have here to repeat that the temperament, habits, and manner of keeping cows tied up in a stall lead to the observation of cases in these animals which would give rise to symptoms at a comparatively early period in the hard-worked horse.

"With regard to external tumours, their weight is sometimes very great, and when connected with the apex, may attain a size far exceeding that of the heart itself, without inducing very serious symptoms. This is not the case when the deposits invade the base of the heart, when they obstruct the vessels and arrest the circulation. If the veins are chiefly implicated, dropsical effusions with symptoms of debility, palpitating heart, and coldness of the extremities, etc., are observed. If the arteries become constricted,

the imperfect flow of blood soon leads to great prostration and hectic, the animal lingering on to die in a state of great emaciation.

"The tumours examined, and which are connected with the exterior of the heart, originate in the substance of, or immediately beneath, the pericardium, which yields, and is continuous, in all cases I have examined, with the envelope of the growth. The tumours are usually unattached to the parietal layer of the pericardium, and lie free in the pericardial sac.

"The tumours are often multiple, and this is chiefly the case in cancer and melanosis.

"1. With regard to the parasitic growths, I have examined in Bologna a polypus containing as its nucleus a cyst, within which were admirable specimens of *Echinococcus veterinorum*. Another remarkable specimen, preserved in the museum in that city, consists in a large mass of cysts hanging from the apex of the heart of an ox. These are cysts of the same parasite. *Cysticercus tenuicollis* has been met with in the pericardial cavity; *Cysticercus cellulose* in the substance of the heart of a pig; and *Doelinius trigonocephalus* in the cavities of the heart of a dog.

"2. I have seen several instances of melanosis implicating the heart, but only recognised after death.

"3. In referring to cardiac polypi, I may draw attention to a paper by my brother, Mr. Arthur Gamgee, published in the second volume of the *Edinburgh Veterinary Review*, p. 30, in which a specimen is described as follows:

"CASE I. *Tumour occurring in the left Auricle of the Heart of a Cow.*—The morbid specimen, of which a drawing is appended, was brought to the New Veterinary College from the Edinburgh slaughter-houses. The heart had, by the man who had killed the animal, been at once recognised as presenting an abnormal appearance; no account was, however, forthcoming of the state of the beast during life. The heart weighed 5 lb., and with the exception of very great distension of the left auricle, appeared quite healthy. The left auricle had been cut before it was brought to us, and from the opening a fibrinous mass protruded. The left ventricle was first opened by a longitudinal incision along the septum ventriculorum, both on the anterior and posterior surface.

"Description.—On examining the auricle through the auriculo-ventricular opening, it is found distended by a tumour, which so thoroughly obstructs the opening as to render it a matter of mystery how blood could pass through the pulmonary veins into the ventricle. On making an incision from right to left along the upper surface of the auricle from the body to the auricular appendage, the tumour is observed to fill the whole extent of

the cavity, to the right side of which it is attached by a broad base. On drawing out the tumour from the auricle by turning it on its base from left to right, it is exposed in the position shown in Fig. 11.

“ Around the tumour shreds of blood-clot exist, but the mass itself has a pinkish-yellow colour, rather nodulated on the surface, which is smooth, with the exception of a considerable patch of gritty roughness and greyish-yellow colour; at the lower surface, the shape of the tumour exactly represents that of the distended auricle, and on superficial examination of its pedicle, it appears to have an extensive attachment to the wall of the auricle, the endocardium seeming to extend over the mass. The tumour has a decidedly elastic feel, and in some parts the recoil on pressure is such as almost to resemble fluctuation.

“ Before proceeding with the description of the internal aspect and structure of the tumour, I must mention that the auricle appears healthy throughout, and its lining membrane smooth, except approaching the mitral valve, the flaps of which have a shrunken appearance, and a decidedly uneven upper surface. The left flap is perforated in its centre by five holes, the membrane of the flap, especially around one of these, being decidedly attenuated. Another hole considerably to the right, is much larger and jagged. The right flap is thickened in some parts, attenuated in others like the left, but only perforated by a few minute holes near its free edge. The chordæ tendineæ are healthy, the papillary muscles well developed, the ventricle presenting no morbid characters. In order to examine the structure of the tumour a clean section was made through its middle, dividing it and its pedicle very nearly in half. The feel imparted by the knife resembled that of cutting through soft cheese, with the exception of the peduncle, which was tough and fibrous. Each cut surface showed the bluish-red structure of the peduncle, ramifying from its base into the tumour, extending from right to left, but sending out broad processes into a stratified mass of pinkish-yellow fibrine, the outer layer of which, circumscripting the whole, appeared the toughest. This fibrine exactly resembled that found in the sac of an old aneurism. No juice could be squeezed from the cut surfaces.

“ *Measurement of Tumour.*—Greatest length is in transverse direction, i.e., at right angles to the pedicle, $4\frac{1}{2}$ inches; from the centre of the pedicle to the highest point on the surface, $2\frac{1}{4}$ inches; pedicle, from base to the uppermost ramification, $1\frac{1}{2}$ inch. In front of the pedicle is a small flattened tumour, about 1 inch in length and half-an-inch in width, possessing the same physical aspect as the other, without gritty deposit, and firmly attached by a very slender and long peduncle.

“ *Microscopic Examination.*—On examining the connections of the pedicle and the layer of fibrine surrounding it, there is evidently a gradual transition of structure, from the tough fibrous and vascular peduncle to the cheesy granular and exsanguine fibrinous deposit. On examination with the microscope, the peduncle is seen composed of fibrous tissue, and interspersed are elongating lymph corpuscles (1, Fig. 11). Towards the processes of this fibrous deposit, the tissue is more imperfectly organized; fibroplastic cells (2) are more numerous, and as we extend from the centre these in their turn gave way to the unchanged lymph-corpuscles (3) and molecular matter constituting each compact layer. In some parts towards the surface of the tumour, the molecular matter almost entirely constitutes the layers; in

others the lymph-cells are very abundant. The gritty deposit on the surface effervesced on the addition of hydrochloric acid, and some phosphatic crystals (though few in number) were seen.

"CASE 11. *Cardiac Polypus* firmly adherent to the Internal Wall, of the



Fig. 11.—*Cardiac Polypus*. 1, Fibrous tissue of peduncle; 2, Lymph corpuscles; 3, Elongated cells.—*Gamble*.

Right Auricle.—(This is the description of specimen 2510 in the museum of the University of Bologna.)

"Professor Alessandrini says of this tumour, that it occurred in an ox, nine years old, that died suddenly, and which previously had shown no signs of ill-health. A vertical section of the heart being made from the

base to the apex, exposing all the right ventricle and part of the right auricle, a polypus comes into view, exactly resembling in form and consistence those found on mucous surfaces, in the uterus, vagina, and the



Fig. 12.—Cardiac Polypus.—*Gamgee*.

nares. This polypus (Fig. 12) is attached by a rather slender pedicle to the internal walls of the right auricle next the appendix, and nearly fills the cavity of the right ventricle, dragging down the wall of the auricle, to which it is attached, to the level of the ring of the tricuspid valve. The polypus is of a somewhat circular shape, and its dimensions before immersion in spirit were as follows :

	Inches.
Greatest circumference from one side of pedicle to the other, going over the largest part of tumour	13.39
Circumference of pedicle	2.44
Circumference at the thickest part of tumour	9.17
Greatest length	5.39
Greatest width in the centre	3.93

"This polypus was very firm, elastic, and almost appeared to contain fluid; none was, however, found on section. Polypi that have reached so advanced a period of organization are of extreme variety, and my search for cases of them in periodicals and in works on diseases of the heart has been very unproductive."

"In the sixteenth volume of the *Veterinarian*, Mr. Kay, of Pontefract, describes a singular case which occurred in a quey thirteen months old, and in which, from the irregularity of the blood's flow, Mr. Kay suspected disease of the heart. The animal lived several days, and, after death, a polypus was found adhering to the wall of the right auricle, and another existed in the right ventricle. The latter, also adhering to the wall, weighed from five to six ounces. The remarkable feature of this case is, that two calves, about the same age and out of the same cow, had died in previous years exhibiting the same symptoms before death.

"*Cancerous Growths.*—The heart is usually involved in cancerous disease only when the constitution fails in cancer of other organs. The deposits are therefore secondary; though instances are not wanting of cardiac tumours, probably malignant and unconnected with cancer in other organs. Cancer of the heart obeys the same laws of development as cancer elsewhere. It arises in a circumscribed spot and spreads in every direction, usually towards the base, and invading not only the tissues around the heart and vessels, but destroying the walls of the first and coats of the second by progressive infiltration."—*Gamgee*.

CYANOSIS.

Cyanosis, or what is commonly termed the *Blue Disease*, is chiefly seen in young animals. It is due to a communication between both sides of the heart through the foramen ovale, which normally only exists in foetal life. Gamgee speaks of it thus: "I have mentioned at page 326, that in foetal life the two auricles of the heart communicate by an oval opening; this causes an admixture of the blood returning from the system with that returning from the lungs. After birth the opening is perfectly closed, and if it remains open, the purified blood from the lungs in the left auricle becomes contaminated by blood which has been the round of the system, and returns of a dark colour to the right auricle. The consequence is, that venous blood circulates through the arteries, so that the visible mucous membranes are blue, the development of animal heat imperfect, and, in fact, all the functions of the body

imperfectly carried on. From the blueness of the skin and visible mucous membranes, this affection has received the name of Cyanosis, or the blue disease.

"As pervious foramen ovale can only be a congenital state, it is observed in young animals. It may prove fatal to them at an early period of life, or from their puny, sickly aspect, their owners may, though in ignorance of the real nature of the cause, resolve to destroy them.

"It may not be recognized until animals are handled in breaking or training; but the difficult breathing, the oppression resulting from even moderate exertion, with marked embarrassment in the functions of circulation, will turn the attention of an observer to the heart. Auscultation reveals an abnormal sound, which not unfrequently consists in the murmur heard in anemic patients, and due chiefly to the condition of the animal."

"It would appear that it is possible to have the foramen ovale re-opened in the human subject. I am not aware of a single observation of this description in the lower animals."

Dr Wardrop says, in his learned work "On the Diseases of the Heart:" "The membrane which covers the foramen ovale is sometimes as thin as a spider's web, or it resembles a piece of lace. At other times it is found re-opened in such a manner as to permit intermixture of the venous and arterial blood. This condition of the foramen ovale was first described by Abernethy, but little notice has been taken of it by subsequent pathologists, though its accuracy is corroborated by morbid preparations in every museum. Having formerly been much surprised to find the heart so little affected when the lungs were greatly diseased, and observing in one or two instances that the foramen ovale was open, I was led to pay more particular attention to the state of that part, and I have found this to be almost a constant occurrence in those subjects where pulmonary consumption had for some time existed previous to the person's decease. I took notice of this circumstance thirteen times in the course of one year, and, in several instances, the aperture was sufficiently large to admit of a finger being passed through it. Now, as the *septum auriculum* is almost constantly perfect in subjects whose lungs are healthy, I cannot but conclude that the renewal of the foramen ovale is the effect of disease—nor will the opinion appear on reflection improbable; for the opening

becomes closed by the membranous fold growing from one edge of it till it overlaps the other; and their smooth surfaces being kept in close contact by the pressure of the blood in the left auricle, they grow gradually together. But should there be a deficiency of blood in the left auricle, and a redundancy in the right, the pressure of the latter on this membranous partition will so stretch and irritate the uniting medium as to occasion its removal, and thus a renewal of the communication between the auricles will take place."

Dr. Aitken observes: "In its *minor degree* it is associated with various forms of cardiac and pulmonary derangement, having the effect of obstructing the flow of blood in the veins of the lungs and of the system generally. The chief of these is constriction or partial obstruction of the pulmonary artery, combined with systemic venous engorgement. In cases of cyanosis the skin is usually thin, the capillaries abnormally large; hence, when obstruction to the pulmonary and systemic venous circulation causes imperfectly aerated blood to flow throughout the system, and still more so in cases when, in consequence of some congenital malformation, a small portion only of the blood is subjected to the aerating influence of respiration, a dark, dusky, more or less livid hue is imparted to the skin.

"In its *more severe form* the condition is usually associated with such a malformation, disease, or injury of the heart or great vessels, as permits venous and arterial blood to mix, and after mixture to be so distributed to the systemic capillaries. A patulous condition of the ductus arteriosus, an open foramen ovale, a deficiency of part of the *septum* of the ventricles, a heart formed of one ventricle and one auricle only—the aorta and pulmonary artery arising from a common trunk—are amongst the usual conditions which lead to cyanosis.

"It is usually, therefore, a congenital affection, and the physical signs vary with the precise condition of the heart and arteries, to which the cyanotic discolouration is due. The action of the heart is usually more forcible than in health, and hypertrophy and dilatation of the right ventricle are almost always present. Deficiency of animal heat is also a constant phenomenon."

RUPTURE OF THE HEART.

Rupture of the heart is met with from time to time in cattle, but more especially in working oxen. Such an accident is necessarily fatal, and death is sudden.

Predisposing Causes.—Previous disease, as softening, dilatation, abscess or ulceration, or obstruction in the neighbouring blood-vessels.

Exciting Causes.—Violent exertion, sudden efforts, direct violence, as concussion and compression of the walls of the chest.

OSSIFICATION OF THE HEART.

This extraordinary condition of the heart has been seen several times in the horse, and an interesting specimen exists in the London Veterinary College Museum. I have not seen or heard of a case in cattle practice.

FATTY DEGENERATION OF THE HEART.

This condition of the heart, so frequently met with in the human subject, comes also under the notice of the veterinary pathologist—indeed a regular attendance at slaughterhouses would reveal that it is by no means an uncommon disease. It is, however, important to distinguish between *fatty accumulation* and *degeneration*. The former almost of necessity follows the absurd and unprofitable system of converting oxen for exhibition into masses of adipose tissue—in other words, piling the fat on at the expense of muscle. In these cases fatty hearts are invariably found. But as Gamgee observes: “In addition to fatty tissue deposited around the heart, the muscular structure gives way, and fibres are observed broken up and replaced by innumerable oil-globules. I have, however, shown that in a case of dilatation the heart was fatty, so that, apart from the tendency to obesity in some cases, and of premature decay in others, when various tissues are disposed to undergo fatty transformation, the heart is implicated by a similar retrograde change.”

Dr. Chambers remarks: "A close copy of the pathological process may be made, by soaking a piece of muscle, say from a healthy sheep's heart, in a running stream, in weak spirits and water, or in nitric acid and water, for a few weeks, when sections made from time to time will exhibit the several stages of fatty degeneration, from the minute specks in the scarcely-altered muscle up to complete conversion into adipocere.*

"Remark in these cases of fatty degeneration or decay that the substance which replaces the highly-organized animal matter is not utterly inorganic. It is less organized and less organizable, but still capable of being called alive. Of our living bodies fat is a part and a necessary part; but still it is not capable of performing the highly-vital duties of muscular tissue, of being as thoroughly alive. Degenerated products, therefore, so long as they form part of the body, may still be said to be alive, but *less* alive than the normal tissues they replace; and degenerate growth may be justly described as 'diminished life,' or, in the words I lately used, 'partial death.' Degeneration, in short, is a greater or less relapse into lower and lower forms of organic life, and exhibits itself therefore in a variety of grades and amounts. Occurring in various parts, it occasions three-quarters of the chronic illnesses which give work to the physician.

"Let it be well understood that these half-living tissues are by no means necessarily lessened in size. A battered and renovated vessel is often much bulkier than a strong new one; and in the same way these under-nourished parts are often enlarged, and so have been wrongly supposed to be over-nourished. They often attain a most cumbersome weight and bigness without really containing tissue enough to do their work. They continue, in truth, a foreign substance."

Independent, however, of obesity, we may get this degenerate condition as the result of defective nutrition and general disease.

Dr. Watson observes: "Fatty degeneration of the heart may proceed from a defect of healthy nutrition throughout the body in consequence of some general disorder, or of natural decay in the decline of life. In such cases the same morbid change is com-

* Figured in "Medico-Chirurgical Transactions," vol. xxxiii. plate 5, in illustration of a paper by Dr. Quain.

monly manifest in other parts also ; in the arteries, in the liver, in the kidneys, in the cornea.

" But fatty degeneration may be limited to the heart, and even to a small portion of the heart, and then it is owing to some local failure of nutrition, of which perhaps the most common cause is a diseased condition of the coronary arteries. You are probably aware that these two vessels have no large or free communication with each other, and it is a very instructive fact that when one of them alone is diseased, that part only of the heart frequently is found to be affected which receives its supply of blood through the unsound artery. Fatty degeneration of the heart is also met with after bygone inflammation, whether of the muscular tissue itself, or of its lining, or its investing membrane. It is no uncommon sequel of hypertrophy. In every instance the change seems ultimately traceable to deficient nutrition."

Dr. Aitken says : " At least two varieties of fatty disease of the heart have been recognized. In the one form the fat, composed of oil in nucleated cells—the ordinary fat-cells—grows on the surface of the organ, between its muscular fasciculi and the reflected pericardium, especially at the junction of the auricles and ventricles, along the trunk of the coronary veins, at the edges of the ventricles, at the apex, and at the origin of the aorta and the pulmonary artery. The right ventricle is often almost entirely covered with fat.

" This form of fat accumulation is not degeneration ; but it so gradually encroaches on and insinuates itself between the muscular fibres, that it conceals, impoverishes, and ultimately causes them to waste, so that the muscular walls become thin, especially towards the apex and over the walls of the right ventricle. In these parts the fibrous structure almost disappears, and the *columnæ carneæ* appear to spring altogether from the *endo-pericardium*. In this form of fatty heart the muscular fibres may remain healthy, although they sometimes eventually degenerate.

" In the other form of fatty heart a degeneration of the fibre ensues. Its muscular element disappears, and its place is taken by fat in a molecular form, and minute oil-globules ultimately come to fill the sheaths which previously contained muscular fibre. But it is now observed that various forms of degeneration are capable of microscopic demonstration in the minute fibrillæ of the heart's substance, the result of decay or disintegration."

Symptoms.—There are no positive symptoms by which this condition of the heart can be detected during life. The pulse may be intermittent, feeble, or slow, as in other affections of the organ, and rapid exertion may produce distress. The heart-sounds are variable—sometimes loud and bellow-like, sometimes tumultuous, at other times dull. Sighing is very frequently present, and in severe cases the gait is staggering. Beyond these, the veterinary practitioner has nothing to assist him until an examination after death reveals the real state of the case.

Post-mortem Appearances.—"In examining a heart thus diseased, the eye first notices the fainter tracing, or the utter absence, of those transverse marks which cross the fibres of all the voluntary muscles, and less distinctly those of the involuntary muscle, the heart. In an early stage of the disease these cross lines are dimly seen, and the fibre is studded here and there with small dark points. When the disease is more decidedly expressed the dots are more numerous, and the striæ disappear. These dots are little globules of oil; lying within the sheath of the fibre, they make it soft and pliable.

"The parts of the heart which have undergone this change are altered in colour as well as in existence. They are pale, like a faded leaf, or of a yellowish-brown, or a muddy-pink colour, and they commonly have a spotty or mottled appearance. The change of texture varies in degree and in extent. It may render the muscle merely soft and flabby, or it may reduce it to a state in which it feels like a wet kid glove, and can be torn as readily as wet brown paper. Every chamber of the heart is liable to this kind of disease, but most of all the left ventricle, then the right ventricle, then the right auricle, and least of all, the left auricle. Generally it is more evident in the columnæ carneæ, and near the endocardium, than elsewhere."—*Watson.*

Treatment.—Medicinally, mineral tonics are indicated in a disease of this nature. The diet should be moderate and good; fatigue should be avoided, and hygienic measures should be strictly adopted; in fact, "anything calculated to impart tone to the system, improve the condition of the blood, and so induce more healthy nutrition of the heart" (Fuller), should be prescribed. Constipation should never be allowed to take place.

ECTOPIA CORDIS.

Ectopia cordis, or *Misplacement of the Heart*, is a condition sometimes met with in young cattle—"chiefly," says Gamgee, 'in calves, and the most common form consists in the heart being situated outside the chest and communicating simply by the large vessels which attach it within the interior of the body.

"The fissure through which the vessels thus communicate with the heart is in the sternum. Professor Hering has published interesting cases of this description, and made important obser-



Fig. 13.—Ectopia Cordis : Schistocormus Fissisternalis.—Hering.

vations on the heart's action under such favourable opportunities. The displacement may consist in the heart being pushed up at the root of the neck, or, lastly, in the organ descending on the abdomen. All the animals in which it has been observed have died within a short time after birth.

"A malformation of the pericardium and walls of the chest occasionally brings the heart in view, though in its natural cavity. Such a condition has been witnessed in man as well as in the lower animals."

PERICARDITIS.

The pericardium or serous membrane covering the heart is often the seat of inflammation in the ox. It may occur as a primary or idiopathic disease, or traumatic from injuries, or become complicated with constitutional maladies, especially rheumatism, purpura, pyæmia and epizootic pleuro-pneumonia.

Causes.—The causes of idiopathic pericarditis are damp, cold, variable temperature, and those generally which induce disease of the respiratory organs.

Pericardial inflammation may be acute or chronic.

Symptoms.—These are very frequently obscure, chiefly owing to the anatomical conformation of the lower animals, viz., the large thoracic surface covered by the shoulder. Usually the animal is dull, and the countenance betrays anxiety; there is a great disinclination to move; the pulse is quick, wiry, and often irregular. The breathing is short and simulative, the condition known as broken wind; a jerking double movement at the flank, with a deep line along the margin of the costal cartilages, coughing causes extreme distress. The limbs and surface of the body are frequently cold, and the former become in the advanced stage oedematous, and there is considerable effusion also in the brisket.

Percussion on the left side causes pain, and the animal rapidly wastes. "Associated with this inflammation, spasms or cramps of the superficial muscles are often witnessed. Most frequently the cramps are confined to the muscles of the pectoral region and neck; but occasionally those of the posterior extremities are also more or less violently affected."—*Williams*.

Auscultation reveals friction-sounds similar to those observed in man. It is a peculiar rasping murmur, having a double sound, termed by Dr. Watson "*to and fro*." This symptom was first discovered by Dr. Stokes. "It is apt to disappear gradually from below upwards with the increase of effusion, and to return with its decrease. It may disappear from the apex to the base with the progressive formation of firm adhesions. It is usually limited to the region of the heart, but changes its character and its seat from day to day. It is sometimes remarkably modified by local bleeding, passing from a loud rough sound to a soft bellows

murmur—most rough and intense during inspiration. The hand applied over the cardiac region will sometimes detect a rubbing sensation, which ceases with the cessation of pericarditis.

"In the diagnosis of pericarditis, however, it is necessary to bear in mind that *friction-sound is not necessarily present in pericarditis*. During the progress of the case, friction-sound may be absent for long periods in one case, or it may be present for a long period in another; its presence or its absence bearing no appreciable relation to the intensity of the disease. The amount of fluid effusion has much to do with this. A really considerable effusion of fluid generally at first muffles, then renders barely audible, and finally removes the sound, the friction-sound becoming indistinct as the heart's sounds are gradually extinguished. Like the heart's sounds, the friction-sound continues audible longest, and is recovered soonest towards the base. When the lymph is rapidly condensed into firmer granulations, and the parts of those most exposed to attrition have become polished and rubbed away, so that the points gradually recede from each other, presenting fewer and fewer points of contact, then the friction-sound may subside, although no further effusion of fluid takes place."—*W. T. Gairdner*.

"Again, *the presence of friction-sound is not necessarily a proof of the existence of pericarditis*. There are permanent exocardial murmurs, probably associated with the 'milk spots' on the anterior aspect of the heart, as pointed out by Professor Gairdner. *It is only when the murmur arises for the first time under observation, or when it accurately coincides with the development of symptoms, or where it corroborates and explains the symptoms and the other physical signs already existing, in such a manner as to leave no doubt of its nature, that we are justified in assuming that a friction-murmur over the heart is pathognomonic of acute pericarditis.*"—*Aitken*.

As the disease advances the eyes become unusually bright, the breath is taken in gasps, the pulse becomes more irregular and tumultuous, the secretions generally are scanty, and death takes place from syncope due to paralysis of the left ventricle: occasionally delirium precedes a fatal termination.

Terminations.—Pericarditis may terminate by resolution; rarely the case in the ox; usually serous effusion takes place, with the formation of solid lymph.

Post-mortem Appearances.—"The adhesive results of inflammation often co-exist with the preceding inflammation, and lymph is generally formed in much greater quantity than from any other serous membrane. The lymph may be only in such quantity as to render the serum turbid, or so extremely loose in its texture as to float on it. More commonly, however, it is disposed as a membrane, often covering both surfaces of the pericardium, and especially that covering the heart, and measuring from two to several lines in thickness. This mass, when considerable, presents a remarkably irregular appearance, which has been compared to the stomach of a calf, to a portion of a honeycomb, or to two opposed surfaces united by grease and then forcibly separated. If the patient dies in the acute stage this membrane is found only slightly coherent, and very rarely exhibits any trace of organization.

"When acute inflammation results in purulent exudation (which it does slowly), and associated with a constitutional cause, the pus is generally of a laudable, healthy character, though sometimes of a greenish hue. The quantity is very various, sometimes only a few ounces, but in other cases so abundant as to fill the pericardium."

Hæmorrhagic Pericarditis.—"In cases where there is a disposition to purpura or scurvy, it occasionally happens that blood, as well as serum, is effused within the sac. The source of the blood is from the new-formed vessels which, being yet tender, give way; or it may be from the highly-congested vessels of the serous membrane and the softened tissues which prevail in scorbutus. The lymph of such casts is of a spongy red colour and shaggy appearance, exactly similar to that which extends from the large intestine into the small gut in cases of scorbutic dysentery.

"In the chronic forms of the disease all these morbid states may be observed; and when lymph has been effused it is then commonly found organized, so that the pericardium is often partially or universally adherent all over the heart. In some instances the lymph effused, instead of forming adhesions, becomes converted into cartilaginous and even osseous patches, which are readily detached from the surface of the heart by the scalpel.

"The acute forms of pericarditis generally involve the muscular walls of the heart to a greater or less extent. On cutting through them the muscular substance is seen for a greater or less depth of

a deeper colour than usual, and the cohesion of the tissue is also impaired, the finger readily passing through it."—*Aitken*.

Traumatic Pericarditis.—Among the lower animals there are probably none so liable to injuries to the heart as ruminants. Their propensity to swallow strange substances, as wire, nails, needles, etc., has been noted by all veterinary surgeons; and these materials invariably, when they leave the stomach, find their way to the pericardium and heart. Several such instances have fallen under my own observation. The following case will serve as an illustration: On the 18th October, 1876, I was requested to visit a new-milched cow belonging to A. C. Twentyman, Esq., of Castlecroft, near Wolverhampton. I found her breathing short, eyes unusually bright, pulse quick, temperature 105°, milk nearly gone, and no appetite. I was informed by the bailiff that she had appeared well until the day but one previously, and he thought she must have taken cold during one of the bleak nights she was out. There was, however, no grunting or cough; the breathing, which I have stated was short, was to appearance much the same as one observes in a "broken-winded" horse—a jerking double movement at the flank. On auscultation, congestion of both lungs—particularly the left—was manifest. I ordered mustard to be applied to the sides, and sent a diffusible stimulant, to be given in gruel morning and night. She continued in the same state until the 25th, when diarrhoea set in, and I observed the slightest perceptible grunt; her pulse had now reached 96, and the temperature was still high. From her disinclination to move, the absence of any cough, the grunt, and the peculiarity in the breathing which I have observed before in such cases, I suggested the probability of a needle or some other foreign body having been swallowed. The bailiff then told me that in three fat beasts they had slaughtered, a short time since, they had in one found a piece of wire bent up in the paunch, and in the other two some long spike nails, etc. With this statement my conviction that I had diagnosed correctly was strengthened.

The diarrhoea, loss of appetite, and wasting continued; gruel was administered, and tonics and astringents were had recourse to, but all alike in vain; and on the 28th I found her lying on her broadside (the right) in great agony, breathing in short gasps, alternated with a grunt. In an hour and a half death terminated her sufferings.

On opening the chest I found the lungs, pericardium, and diaphragm adherent; the pericardium was immensely thickened, nearly black in colour, and contained at least half a gallon of fluid. The heart was bleached, and presented a peculiar wrinkled appearance, due, I opine, to its submergence for a length of time in such a quantity of fluid; its weight, with pericardium, was seventeen pounds. On examination towards the apex on the left side, I discerned what appeared to be a small ragged hole. On attempting to insert the little finger, it came in contact with a sharp substance. This was then immediately felt for, and withdrawn, and proved to be a stocking-needle, three inches long, with a broken eye. On opening the heart, I found the needle had passed through the opposite wall into the right ventricle, and again into its outer wall, skewering it through as it were; and from the cartilaginous nature of its channel, and the encrusted condition of the metal, it had evidently been there some months. On examining the stomach (*rumen*), the place where the needle had passed through was plainly visible, as it was also in the diaphragm and pericardium; the former had healed and become thickened at that place, but the two latter were still inflamed. The lungs were congested sympathetically. One usual feature in these cases was absent, viz., an intermittent pulse; and this, I think, the position of the needle will account for; had it entered higher up, a different effect must have been produced, as well as a speedier termination.

Yount mentions a case where a piece of wire two inches in length was found sticking in the pericardium, and which had produced extensive ulceration and gangrene there.

Another cow was attended by Mr. Cartwright, of Whitchurch. She was near the time of calving when she became seriously ill, but the symptoms did not indicate any connection with parturition; indeed they were of that obscure nature that it was impossible to say what was the malady. There were dulness, unwillingness to move, constipation, and oedematous swellings about her. She died on the sixth day. On opening her it appeared that the heart, and its investing membrane or bag, occupied nearly three times their natural space. The delicate and transparent membrane was thickened until it bore no slight resemblance to a portion of the paunch; and the bag contained a gallon of discoloured fluid. A piece of a darning-needle, two inches and a half in length, with the

eye broken off, was found in the pericardium, and a small ulcer, three-quarters of an inch deep, appeared near the apex, or point of the heart. Two sixpenny nails were found in her paunch.

Treatment.—"Pericarditis is not an incurable disease. It is often fatal in a very short time, not lasting more than from five to eight days, but many cases recover. The method of treatment varies according to the circumstances under which it is developed. It may be necessary to treat an animal for an attack of rheumatism or influenza, of which the pericarditis is but a complication. If developed as a specific disease, active antiphlogistic measures must be adopted at first. Bleeding may be resorted to in the earliest stage, though its importance is not, in my estimation, so great as the administration of an active cathartic. A large mustard poultice may be applied to the chest, and salines administered at intervals. Sedatives have been strongly recommended, and amongst others, digitalis. The following prescription is one amongst many forms in which this remedy has been administered :

Acetate of Lead.....	2 drachms.
Powdered Leaves of Digitalis	2 drachms.
Powdered Liquorice Root.....	2 ounces.
Powdered Marsh Mallow Root.....	1 ounce.

"Add sufficient water to make an electuary. A fourth part to be administered every three hours to horse or ox. The extremities must be hand-rubbed and bandaged, the body covered with warm clothing, and any of the large herbivora may be allowed cold water *ad libitum*, containing about an ounce of nitre to the pailful."

—*Gamgee.*

"The treatment of idiopathic pericarditis must be directed to allay pain and undue irritability. For this end aconite is recommended ; if pain be great, repeated doses of opium are to be administered ; the bowels are to be kept regular by moderate doses of oil, and the absorption of the effusion promoted by diuretics.

"It was supposed at one time that calomel had the power of causing the removal of the exudates, and it was consequently largely employed ; but its administration is now generally condemned, and Dr. Watson confesses, in the following remarkable words, that the hope which he once cherished that the inflammation could be controlled by the constitutional influence of mercury has faded

away. He says: 'Pericarditis has been known, not seldom, to spring up while the patient was already under mercurial salivation. I am obliged therefore to recant the advice which I was formerly in the habit of giving in respect of mercury as a remedy for acute pericardial inflammation.' If debility be present, the weakened heart must be supported and invigorated by moderate doses of stimulants in combination with opium.

"Bleeding, except to relieve urgent symptoms in the earlier stages of the disease, had better be withheld, as there is a strong tendency to an early diminution of the cardiac energy. Blisters are not called for in the earlier stages of the disease, but their application may, in some rare instances, be necessary to promote the absorption of the effusion. Tonics, more especially the salts of iron, prove useful in promoting the absorption of the effused fluids, and are to be given alternately or in combination with diuretics or the iodide of potassium. In the rheumatic form colchicum is indicated. Digitalis, so highly recommended by some authors, appears to me to act injuriously; it destroys the appetite, is uncertain in its action on the heart, and, if persevered in, its toxic, cumulative effects are apt to cause serious derangement.

"To sum up, it may be stated that warm fomentations to the sides, warm clothing, bandages to the legs, with careful administration of remedies calculated to relieve such urgent symptoms as may arise during the progress of the disease, and allowing the animal a plentiful but not over-abundant supply of easily digestible nutritious food, are the general principles of safe treatment.

"If there be danger of death from hydrops pericardii manifested by orthopnea, obstruction to the venous circulation, and a serious interference with the heart's action, paracentesis is to be performed; a small trochar being used, which is to be introduced carefully at the side of the sternum, between the cartilages of the fifth and sixth ribs."—*Williams*.

In my own practice I have found aconite, 10 to 15 minims given every three or four hours, to be extremely beneficial, and where there is extreme debility, I usually prescribe brandy with tinct. of ferri. In advanced cases the iodide of potassium is exceedingly useful. In all cases of pericardial inflammation, I am of opinion counter-irritation should be used. Mustard or ammonia and tur-

pentine liniments in the acute stage, and strong iodine preparation in the advanced form. Alkaline drinks in the rheumatic form of pericarditis should always be allowed.

The general principles of safe treatment are summed up by Dr. W. T. Gairdner: 1. To make large allowance for the insignificant and spontaneously healing class of cases revealed more by physical signs than by symptoms, and to regard them as demanding little active treatment; 2. To consider rheumatic pericarditis in general as a disease susceptible, to a great extent, of cure under palliative local remedies and fitting constitutional treatment; 3. To hold the general treatment as subordinate to the constitutional treatment of the disease with which the pericarditis is associated.

In traumatic pericarditis treatment is useless, and if the animal be in marketable condition, slaughter is the wisest measure.

ENDOCARDITIS.

Endocarditis or inflammation of the serous membrane lining the chambers of the heart and covering the valves is a more frequent disease than the former. It is described as being "much more fatal than any other acute cardiac affection, for the reasons that it is often associated with a mal-condition of the blood; that it leads to valvular alterations and to a deposition of fibrinous coagula on the valves, which destroy life by interfering with the circulation of the blood, or, carried away by the blood to other parts of the body, by obliterating the capillaries of other organs, leading to softening, abscesses, or sudden death, or undergoing degradation by poisoning the circulating fluid."—*Williams*.

Endocarditis may be the result of constitutional tendency, or be associated, as is more frequently the case, with rheumatism, of which in an acute and prolonged attack of the latter it is invariably a sequel.

Pathology and Morbid Anatomy.—"By a species of preference the coverings of the orifices and valvular structures of the heart are by far the most frequent seat of lesion in the internal inflammation of that organ. The frequency with which these parts suffer may in some measure be explained if their minute anatomical and

histological relations are connected with the morbid state of similar tissue. The peculiarity of the minute structure of these parts, as influencing the arrangement assumed in the first instance by morbid deposits, seems to have been first definitely stated and illustrated by Dr. Watson (Lect. lxi., p. 275, 3d edit.). There is found to exist enclosed between the reduplications of the endocardium a quantity of fibrous tissue. An increase in its amount takes place at the centre of each aortic valve, forming the *corpora aurantii*, and at each of the extremities or angles of the segments. The minute exudations which are formed as the result of the inflammatory process in the endocardium may be seen to arrange themselves in double festoons, suspended as if from the *corpus aurantii*, often in a row, like a string of beads, along the line of union of the thick portion of the valve, with the inner convex margin of its two thinner crescentic portions. The repeated attritions of the opposed surfaces of the valves pushes aside the exudation as fast as it is deposited, and while yet plastic, from the thin crescentic portions of each valve, and so heaps it up along those boundary-lines of contact just as a thin layer of butter on a board would be displaced and heaped up in a little curvilinear ridge by the pressure of one's thumb."

While, doubtless, the structure of the serous membrane is the same throughout the heart, yet its mixture with white fibrous and elastic tissue, in great abundance at the valvular reduplications, renders it prone to disease, especially in those constitutional states of the system in which the fibrous textures are more particularly involved, as in rheumatism. These are the parts also on which the great tear and wear in the action of the heart is expended, and thus they are probably the first to suffer, owing to the mutual friction of the valvular edges upon each other.

Diffuse inflammation of the endocardial membrane has been known to follow the application of a ligature round an artery. The morbid appearances of its inflammation are similar to those in other serous textures—namely, a silvery opacity, and more or less thickening of its tissue. Inflammatory lymph is often found strongly adherent to the valves, as already described, and forming fringe-like or fibrinous warty growths, or excrescences, as they are termed. By its agency the lappets of the valves become variously distorted in shape, or soldered together, and insufficient to perform



Fig. 15.

ENDOCARDITIS . FIRST STAGE.
WEST

their functions. By the subsequent changes which take place in the deposits, an orifice, naturally large, may be reduced to the condition of a mere slit, or to the diameter of a goose-quill. One segment of the aortic valve may, for example, be turned up and bound to the aorta, or it may be turned down and bound to the inner surface of the heart, or it may be curled up like a shell.

"The prolonged existence of the inflammatory state ultimately thickens and hardens, by interstitial deposit, the tissue enclosed between the folds of the serous membrane constituting the valves, so that their action is much impaired. These changes may be limited to the fibrous zone which forms the base of the valves, surrounding the aortic orifice with a sort of collar, contracting its diameter, as well as impeding the play of the valves. In other cases the thickening may affect the free edge, or the central portion of the valve. The most remarkable circumstance, however, connected with chronic adhesive inflammation of the left side of the heart, is the excessive tendency which the valves have beyond all other serous tissues to become cartilaginous or ossified. This transformation commences in the substance of the serous tissue, but more commonly in the tissue connecting the duplicature of the valvular fold. This ossific deposition is not necessarily preceded by a cartilaginous formation, but is most frequently an original abnormal secretion, often containing a good deal of earthy matter. In all the instances in which I have examined such deposits, they did not exhibit the histological appearances of true bone tissue. It is deposited in various forms: sometimes in layers, at others in points, and at others in large masses, in knobs or pyramids, occasionally acquiring a size as large as a pigeon's egg. Sometimes the tendons, or the *chorda tendineæ* attached to the mitral valve, participate in the indurations, and Corvisart met with one entirely ossified. The irritation of these deposits often leads to their destruction, and the whole exudation, softening and breaking down, may mingle with the current of the blood, and produce results, to be noticed, of a most serious description.

"The tendency of endocarditis is:

"1. To produce those affections of the heart which are also described respectively as *valvular disease of the heart*, *hypertrophy*, and *dilatation*—morbid conditions more or less simple or combined.

"2. Associated as it often is with pericarditis, and acknowledging rheumatism as a most frequent exciting cause, we have the *muscular* substance of the heart itself sometimes affected, constituting what Dr. Watson terms *rheumatic carditis*."—Aitken.

Symptoms.—Gangee observes: "The general symptoms of irritative or rheumatic fever are attended with very marked local symptoms of heart disease. There is very decided interference with the action of the heart, and its contractions are energetic,

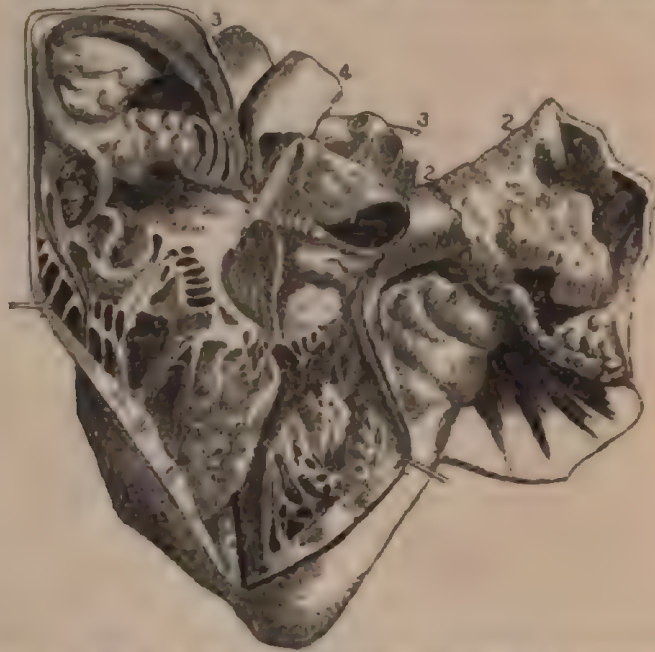


Fig. 14.—Thickening of the Endocardium as the result of inflammation.—Gangee.

vibratory, and often irregular. The pulse is unequal in its beats, and often intermittent, and there is a marked contrast between the violent heart-beats and the smallness of the pulse: Leblanc says that this sign is very important in distinguishing endocarditis from pericarditis. This author notices specially a loud metallic tinkling in connection with endocarditis, as well as a *bruit de souffle* or bellows-murmur. A marked venous pulse is seen in this disease, as much as in other acute cardiac affections, interfering with the efficiency of the auriculo-ventricular valves. In the early stages of

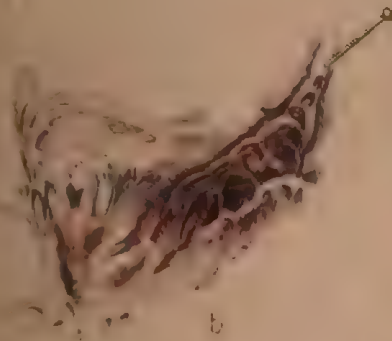


FIG. 16.

ENDOCARDITIS IN THE SECOND STAGE.

- 1. Section of heart showing segments of Mitral Valve thickened & free border covered with folds whitish in colour & pearly
- 2. Section of Tricuspid Valve thickened firm, & palish-white & bound down to the endocardium
- 3. Section of Mitral Valve showing exudation of Lymph beneath the Lining Membrane (West)

endocarditis the breathing is not very laboured ; but if the valves become much impaired, the dyspnoea is very severe. The usual result of a violent attack of endocarditis is shrinking of, and the formation of vegetations on, the auriculo-ventricular valves, with narrowing of the openings with which these valves are connected. Sometimes the whole of the endocardium is thickened, and the seat of deposit in and beneath its structure, as seen in Fig. 14. At other times the inflammation is limited to a part where false membranes and pus may form. It is to endocarditis that we may trace some of the enormous cardiac polypi which I have described in the chapter preceding this one. A remarkable case is recorded by Mr. Gowing in the "Veterinary Record" for 1848. He says :

"Unfortunately, the history of the first case is brief, as I was not called professionally to attend it. All I could gather from the proprietor was that the animal had been purchased by him about five months since. She was of the shorthorn breed, and had calved a few days previous to purchase. When in possession of her owner three or four days, the milk was perceived to assume a peculiar red appearance, as if blood had been mingled with it ; and this continued till the animal died. At this time she fed well, and was improving in condition, and it was anticipated the milk would resume its natural state, and likewise increase in quantity ; instead of which it diminished, the appetite became impaired, and the animal was observed by the dairyman suddenly to fall down. She was raised, and the body and extremities rubbed, and she apparently recovered, remaining seemingly in health for the period of five or six weeks, when she again as suddenly fell. Being raised, and the same means adopted as at first, she soon after again recovered ; but she now lost flesh rapidly, and although the owner resorted to the aid of medicines, it was evident she was fast sinking : he therefore determined to sell her in the state she was, rather than to incur any further expense. On going into the cow-house on Thursday morning last, he perceived the animal was again down ; but remembering she had fallen twice before, he took little notice of it : on a closer examination, however, she was found to be dead.

"*Morbid Changes in the Heart.*—The organ, viewed externally, presented the left auricle prominent, and of a rounded form. The heart itself was somewhat elongated, and smaller than natural. On making a section of the auricle just at its base, a solid mass of matter, of a dark colour, and as large as a man's fist, was perceived, filling up the cavity, and also passing into the auriculo-ventricular opening, adhering slightly to the bicuspid valve. Superiorly, a portion of it had entered two of the pulmonary veins. On its upper and outer part a cup-like cavity existed, which evidently had contained pus. The mass itself was adherent only to the supero-external part of the auricle, and thus a passage was formed for the blood from the pulmonary veins into the auricle, the muscular walls of which were much dilated and attenuated.

"Examining the points of attachment, the nature of the abnormal deposit was disclosed, and also the causes that must have been in operation to pro-

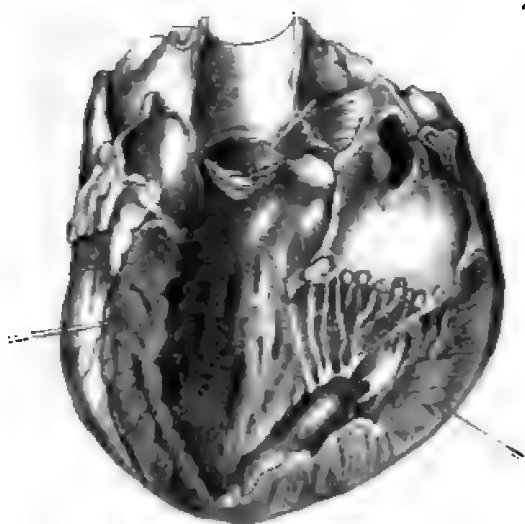
duce it. The serous lining membrane had evidently been intensely inflamed, and depositions of lymph, which had become organized, had taken place, giving rise to a considerable thickening of this membrane. Layer after layer of fibrine had become separated from the blood as it passed over this diseased membrane, and thus the mass was gradually formed. Through the continuation of the inflammatory action the pus was secreted, which filled up the cup-like cavity, the walls of which had been formed by the separated fibrine, as already described.

"The great peculiarity of this case is, the existence of inflammation in one part only of the lining membrane of the auricle. It is also singular that this diseased action is more commonly met with on the left side of the heart than on the right. The sudden and repeated falling down of the animal will be, of course, referred to an unequal or irregular supply of arterial blood to the brain.

"The case of abscess in the walls of the heart of a cow is even less interesting than that I have recorded, as, during life, the only symptom indicative of diseased action going on was, the animal's always turning to one side when moved or caused to progress. This would rather have awakened a suspicion of the brain being implicated. She, however, died suddenly, when the last-named organ was found to be perfectly normal; but an abscess existed in the muscular structure of the heart, containing more than a tea-cupful of pus."

Concerning the morbid anatomy of endocarditis, Professor Williams remarks: "The first effect of inflammation of endocardium is seen in the form of red spots, streaks, and patches. The redness is always most intense in the neighbourhood of the valves, which in some instances lose their integrity, and become ruptured or detached from their tendinous cords. Supervening upon this, lymph is exuded both into the substance of the membrane and upon its free surface. That upon the free surface is often washed away by the current, but generally speaking it is found between the folds and upon the free surfaces, constituting warty excrescences upon the valves.

"In a specimen now before me, obtained from a cow which had three months prior to death suffered from rheumatic arthritis, there are no less than five-and-twenty of these excrescences, more or less organized, attached to the surfaces of the tricuspid valve. They vary in size from a pin's head up to a large nut; some of them being in the auricle and some in the ventricle, attached not only to the valves but to the chordæ tendineæ, carneæ columnæ, and musculi pectinati, whilst the spaces between the tendinous cords are filled with coagulated blood. In the left side of the heart there are also traces of deposition within the mitral valve, having the shape of irregular white spots. It will be thus seen that there is not



only a deposition upon the free surfaces, but also an exudation in the membrane itself. In some instances the valves become ulcerated, and even the cardiac walls perforated, establishing a communication between the two cavities.

"The growths of endocarditis differ from those clots or coagula which form during or after the agony of death, and they must not be confounded with the corpora aurantii, which are generally more or less enlarged in aged subjects. The coagula, which form during or after death, are not adherent to the parietes, are soft and easily removed.

"In the treatment of endocarditis particular care must be taken to pursue no treatment calculated to lower the heart's action, as debility of the circulation greatly favours the tendency to coagulation of the blood in the heart, and the consequent formation of these coagula. For the same reason, remedies which have the power of modifying the coagulation of the blood, such as the nitrate of potash or the bicarbonate of ammonia, when debility is present, are to be prescribed; and for the reason that inflammations, artificial and natural, increase the fibrinous condition of the blood and its tendency to coagulation, blisters, setons, and all other remedies which constitute the so-called counter-irritant treatment, are to be avoided. The treatment recommended for pericarditis is applicable for endocarditis, with this exception, that those sedatives which diminish the cardiac energy are to be carefully and cautiously administered. They are certainly useful, more particularly aconite, in relieving disquietude and irritability; but they should be given in small doses only, and for the reason above stated, that all remedies calculated to lower the action of the heart promote the tendency to fibrinous coagulation.

"The results of endocarditis are various diseases or alterations in the form and structure of the valves, leading to ulceration, perforation, pulmonary apoplexy, and ultimately to the death of the animal."

Treatment.—The treatment adopted in pericarditis has been usually accepted as applicable to endocarditis. Sedatives, however, are to be given with great care. In the chronic stage the iodide of potassium, combined with tonics, has been recommended. When dropsy exists, diuretics may be administered with advantage. The bowels should also be attended to—constipation is at all

times to be avoided, or anything that produces violent straining—hence drastic purgatives must not be had recourse to.

The diet should be nourishing, but not over-stimulating. Quietude throughout is essential.

WOUNDS.

Wounds of the heart are very common in cattle. Numerous records of the presence of foreign substances in this organ and its investing sac have been given by veterinarians, and many such cases have come under my own observation. Mr. Gamgee, in his "*Domestic Animals*," mentions: "A knitting-needle, a nail, a piece of iron-wire 2 inches, a plank-nail, a hair-pin transfixing the heart, pericardium and reticulum; a table-knife 7½ inches long, passing from the reticulum to the left ventricle; a ramrod 14 inches long, etc., etc."

Prof. Williams observes: "Some writers suppose that needles frequently pass from the œsophagus to the heart. Such an occurrence is quite possible, but my own experience, and that of other veterinarians in this country, points to the conclusion that the foreign body finds its way to the heart from the second stomach—the reticulum—first of all piercing the walls of that viscus and the diaphragm, and being gradually drawn by the suction action of the heart into the pericardial sac, generally wounding some portion—commonly the apex of the heart itself. In cases where a foreign body has been found inducing pericarditis, its course from the second stomach through the diaphragm and mediastinum into the pericardium can be demonstrated—post-mortem—by the presence of a canal or opening, surrounded by walls of lymph, extending from the stomach to the heart; the foreign body itself lying in the canal, generally more or less eroded or worm-eaten by the action of the juices by which it is surrounded.

"Sometimes, however, the foreign body, particularly if a substance such as a needle, which soon rusts, is worn down to a mere fragment, or in some instances has entirely disappeared by chemical decomposition.

"In other instances it has been found in the cavities of the heart itself. A most remarkable case of this kind is described by Mr. Gamgee. This case happened in the practice of M. Camoin,

occurring in a cow eight years old, which presented signs of heart disease. The post-mortem revealed the following lesions: The reticulum and omasum contained about $2\frac{1}{2}$ pounds of clotted blood. No lesion was found in any of the abdominal viscera, except the reticulum, in the curvature of which was a round yellowish patch, with an oblong orifice towards its centre of one-fifth of an inch in its longest diameter; this orifice was closed by a clot of blood. The yellow patch seemed to be from a softening and thickening of the mucous membrane, and around it the reticulum was adherent to the diaphragm. The opening was continuous, with a flexuous canal capable of admitting a large-sized goose-quill penetrating the diaphragm, pleura, and wall of the left auricle. The pericardium contained 3 ounces of a reddish serum; the heart was enlarged and more rounded than natural, of a deep reddish colour, and its coronary vessels engorged with blood; the left cavities were filled with blood; the auriculo-ventricular opening more than normally open; and below this orifice was a little particle of wood, arranged transversely and supported by its extremities on the tendinous cords of the mitral valve, which it pulled down so as almost to close the aorta. This piece of wood, which was a little over an inch long, and as thick as a writing-quill, was no other than a pomegranate prickle, which the creature had picked up in its food. The internal aspect of the left auricle and ventricle was of a deep red colour, intermixed with black patches, which penetrated for some distance into the muscular tissue. Three chordæ tendinæ were torn, the aorta empty; the right side of the heart had its endocardium of a reddish hue, but with no other discolouration. The pulmonary artery was nearly half-filled with very black blood, and the lungs were congested. The whole venous system was engorged with black blood. This case, which is reported much more fully by Gamgee, died on the twelfth day after illness was first observed; and is a rare instance, fully accounted for by the lesions found post-mortem, of death succeeding in so short a time."

CHAPTER IV.

DISEASES AND INJURIES OF THE BLOODVESSELS.

Arteritis.—Aneurism.—Degenerations of Arteries.—Arterial Injuries.—Venous Hemorrhage.—Air in the Veins.—Rupture of the Vein.—Thrombus.—Phlebitis.—Varix.

ARTERITIS.

INFLAMMATION of an artery may be acute or chronic, and affect either one vessel, or pervade a large portion of the arterial system.

Causes.—Injuries by wounds, blows, strains, ligatures, or it may arise from some peculiar constitutional blood condition.

Symptoms.—The diagnosis of arteritis is of great importance. Gangue observes: "I should direct attention to the manifestation of pain in a limb, associated with the most marked general disturbance; the temporary paralysis of the limb affected, or of some of its muscles; the local tremors; the invasion of the opposite limb, as if by metastasis, with the subsidence of symptoms in the limb first attacked; the peculiar throbbing of the posterior aorta felt through the rectum; the absence of pulsation; a diminished pulse in the arteries of the limb implicated; and lastly, the incurable paralysis, partial or complete, of one or two limbs, soon followed by death."

To these remarks may be added: a peculiar cord-like or indurated feel along the course of the affected vessel and the parts it immediately supplies. The pulse is feeble, and has a thrilling and jumping stroke. Both temperature and sensation decline below the affected part. "Should stimulating measures be unwisely adopted to restore these, action beyond the power of control is almost certain to be induced, and gangrene follows."—*Miller.*

Structural Conditions.—"Inflammation of any portion of the arterial system produces structural alterations in the coats of the vessel similar to those resulting from inflammation of any other

texture. Increased vascularity and interstitial exudation of fibrinous matter renders the coats of a bright red colour, thickened and pulpy; the interior of the artery in particular has a crimson hue, as though some irritating fluid had been injected into the vessel, and it is lined with a slight lamella of lymph here and there, whereby the coats becoming fused, the vessel loses its elasticity. The blood within the vessel coagulates and forms a plug, which more or less completely blocks up the vessel, thus rendering it impervious as a blood-conveying tube, and below which the calibre of the artery is somewhat contracted. This plug, conical in shape, consists partly of a yellowish fibrinous exudation, occupying its base, and adhering to the interior of the vessel, and partly of ordinary black coagulum, which forms apparently on this inflammatory portion, and, tailing off to some distance, is not adherent to the vessel. This condition is denominated *adhesive arteritis*. Inflammation, with the apparent secretion of pus, instead of fibrine, from the interior of the vessel, may perhaps occur sometimes, and it is probably of a spreading character; but whether this puriform matter be true pus or disintegrated fibrine, remains, I think, to be determined by further observation. This condition constitutes the *suppurative* and *diffuse* arteritis of some authors.

Course and Terminations.—(1) Absorption of the coagulum may take place, the artery regain its natural calibre, and the circulation be fully restored. (2) On the coagulum remaining and extending, gangrene, in the dry form of mortification, supervenes, the artery becoming contracted and obliterated as a fibro-cellular cord. Gangrene may be prognosticated in proportion to the degree of occlusion, its suddenness, and the size of the arterial trunk. Absorption, or rather transmission of the fibrinous exudation in a state of disintegration, or of pus, if secreted, would seem to occur in some cases, and give rise to the symptoms of *pyæmia*. This event is perhaps more especially incident to diffuse arteritis.”—*Gant*.

Treatment.—The above authority recommends local blood-letting and warm fomentations; the latter to be followed by calomel and opium to prevent fibrinous exudation, and alkaline salines to promote disintegrative solution of the coagulum. But measures used in inflammation of other textures are here inappropriate. Thus stimulants, in their beneficial influence on the general circulation, might increase the exudation of fibrinous matter within the

vessel inflamed, and induce gangrene. Stimulating applications also, as mercurial inunction, to promote absorption of the exudation, would be similarly hazardous.

Chronic arteritis is usually associated with disease of the arterial tissue, and is not unfrequently connected with rheumatism. "It is gradual and insidious in its progress; scarcely marked by pathognomonic symptoms, and seldom discovered, during life, but by its results—abnormal dilatation of the artery and formation of true aneurism. The structural change, however, is sufficiently marked. It may affect an artery throughout its whole extent continuously, or it may occur only in patches, and such patches are usually situate in the vicinity of bifurcations, or at the origins of large arterial branches."—*Miller*.

ANEURISM.

An aneurism is a tumour containing coagulated or fluid blood, and communicating with the artery upon which it is situated. Such tumours are invariably pulsating. No other sanguineous swelling, in whatever way connected with an artery having no direct communication with the tube of the vessel, can be termed an aneurism.

Aneurisms are divided into *true* and *false*. *True* are those which are the result of arterial disease, *i.e.*, disease of the textures of the artery. *False* is where the artery being wounded, the blood not being able to escape externally, becomes encysted or coagulated in the areolar tissue, entirely independent of the arterial coats. The arterial wound remaining open, the tumour gradually increases, and the pulsation is very marked. Or it may become secondary by ulceration of the external coats, the formation of abscess causing pressure, the establishment of internal ulceration, and ultimately communication with the arterial canal.

An aneurism is termed "dissecting" when the internal and middle coats of the artery are ruptured, and the external coat becomes detached for some distance by the infiltration of blood. "Much more frequently, however, the transverse fibres of the middle coat are separated into two layers, for a greater or less distance, in the track of the vessel. Also the dissection may be

either complete or partial. That is, the hiatus between the coats may terminate in a blind sac, where blood stagnates, or whence rather it will regurgitate. Or it may be complete; there being a second aperture of communication with the artery at the extremity of the hiatus, through which the stray current of blood again joins the main stream. Such dissections may be of slight extent, or they may occupy several inches of the vessel. The variety is of comparatively rare occurrence, and is seldom found affecting any artery except the aorta.



Fig. 18.—True aneurism of the aorta. The greater part of the cyst filled with clot. Aperture of communication small.—*Miller*.

"2. *The inner coat alone may remain entire.* The external and middle have given way, and the cyst is formed in the first instance by the dilated internal coat alone, probably the result of ulcerative destruction of the other tunics, from without.

"3. *The inner and external coats have both been found entire; the middle alone having given way.*

"It is useful to remember that aneurism is sometimes connected with the artery by means of a *narrow neck* of considerable extent. Such a tumour is said to be *pedunculated*.

"Aneurism is also said to be *limited* or *diffuse*. In the one case it is bound within the limits of a proper cyst; in the other, having either burst through this, or been originally devoid of it, blood is widely diffused by infiltration into the surrounding tissues. The true aneurism is at first invariably limited. It may become diffuse by giving way of the cyst, from ulceration or otherwise. The occurrence is always secondary. In false aneurism, on the contrary, the form may be diffuse or not at first, according to circumstances. If the escape of blood be sudden, great, and violent, no distinct restraining cyst can form; infiltration is wide and free; the diffuse form is at once established. Or a cyst may have formed and sub-

sequently given way; and then, as in the true form, the occurrence is secondary."—*Miller*.

"*Diagnosis of Aneurism*.—The diagnosis of aneurism is one of the most important points in practical surgery. The following considerations will ordinarily enable us to escape from error. Chronic abscess and glandular or other tumours are the morbid states most apt to assume the aneurismal characters. Often they simulate the disease very closely; strong and distinct pulsation being communicated by a neighbouring artery of large size.

"But—1. Aneurism is soft and compressible from the first, and becomes hard by solidification of its contents. An abscess may be soft from the first, but more frequently begins with induration, and softens secondarily, reversing the progress of aneurism. A small, chronic, and scrofulous abscess may be soft from the first, and may perhaps seem to be compressible. Situate for example in the groin, in the axilla, or at the root of the neck, it may seem to disappear by pressure beneath the surrounding hardness; but, on removal of the pressure, the lively resilience of the aneurism is wanting. An enlarged gland, or other tumour, is invariably first hard, then soft, and never capable of being dispersed by pressure; and, unless suppuration occur, the softening and fluctuation do not supervene at all.

"2. Pulsation is equable in aneurism. At every point, unless much alteration by partial consolidation have occurred, pulsation is felt equally distinct. Whether the tumour is compressed directly downwards, or elevated and compressed laterally, pulsation is the same. A solid or other swelling, not aneurismal, laid over the track of an artery, and receiving impulse from it, has a very distinct pulsation when the first mode of pressure is employed; but when raised, and held by the sides, this pulsation will be found either very faint or altogether absent.

"3. Aneurisms of the large arteries have frequently a double impulse, the first corresponding to the diastole of the artery, the second taking place between it and the following diastole, and corresponding to the systole of the artery. Tumours which merely receive arterial pulsation exhibit only one impulse, isochronous with the arterial diastole.*

"4. Pulsation of aneurism is felt from the first. Not so in the

* *Lancet*, No. 1133, pp. 549, 302.

case of swellings not aneurismal. At first these are small, and not encroaching on the vessel, they receive from it no impulse. Only after some time do they enlarge to such an extent as to be in close contact with the artery, and there they receive its pulsation.

* 5. Aneurism has expansion coincident with pulsation. The fingers placed firmly on the tumour diminish it more or less; pulsation is felt increasing in proportion to the pressure employed.



Fig. 12.—Aneurism, of a double cyst. The first had given way; (the tumour then became diffuse; but a second cyst formed, of non-arterial tissue.—*Sir C. Bell.*

and at each impulse there is a palpable elevation of the hand, by expansion of the walls of the cyst. A swelling not aneurismal, on the contrary, may be elevated at each stroke of the vessel, as well as have its apparent impulse augmented by increase of pressure; but it has no expansion of its entire bulk at every point; it is simply raised, and whether in systole or diastole, its dimensions

are unaltered. There is one exceptional case, however, which may render diagnosis very difficult. If a chronic abscess, or other cyst, overlay an artery thus, then its pulsation will be equal in all directions, each impulse will be accompanied with a sensation of expansion, and *bruit* may doubtless be distinct. Extrication from error, however, is still within our power, especially by reference to the fourth test. Inquiry into the swelling's history will inform us that when small and recent it showed no sign at all aneurismal.

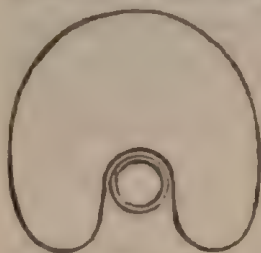


Fig. 20.—Section of an abscess, or other cyst, overlaying an artery. The aneurismal state must be closely simulated.—*Miller*.

"6. An aneurism ordinarily affords both thrill and *bruit* to touch and auscultation; and the latter, in the larger arteries, may be double like the impulse. Another tumour may possess the *bruit*, but has not both conjoined; unless, indeed, it be the exceptional case just stated.

"7. Pressure on the cardiac aspect of the aneurism diminishes its pulsation, bulk, and thrill; pressure on the distal aspect has a precisely contrary effect. Another tumour may have its apparent pulsation similarly affected, but the pulsation only.

"8. Change of relative position affects the aneurism but little; pull it rudely aside, and, by impeding arterial flow, the pulsation, expansion, and *bruit* may be diminished; but, though diminished, they are still there. Do the same to another tumour, and pulsation is gone quite.

"9. Perhaps the tissues are lax enough to permit our tracing the vessel's course with the finger. If the tumour be aneurismal, it will be impossible to detach it from the artery; if non-aneurismal, the vessel will be found at all parts perfectly free. Even at the supposed neck of the aneurism, perhaps, the finger's point may be inserted between the tumour and arterial tube.

"10. In aneurism of the extremities, the limb beneath the tumour is shrunk, wasted, pained, perhaps cedematous. And these appearances are not so marked, if they exist at all, in the case of a tumour which merely simulates aneurism."—*Miller*.

Treatment.—Unless the subject be of extreme value, it is rarely advisable to adopt surgical measures with the ox. Slaughter, if in fair and marketable condition, is usually the wisest advice. In

the event, however, of a curative course being followed, that adopted in human surgery, so far as it is compatible with veterinary science, is clearly indicated. Towards this end, viz. that of cure, there occur: 'Coagulation [of the aneurismal contents; reaction of the superimposed and surrounding parts on the solidified tumour; compression, thereby, of both tumour and artery; probably obstruction of the latter by extension of the coagulum. The fibrine loses its colouring matter, and in part becomes organized—where in contact with the cyst; absorption of the solidified tumour gradually advances; ultimately all traces of the aneurism have almost or wholly disappeared; and the artery is either permanently obstructed and obliterated at that point, or, as more rarely happens, it remains free and pervious.'

"The cure may be either spontaneous or surgical.

"I. *The Spontaneous.*—The changes as affecting spontaneous cure may be induced by various circumstances. 1. *By pressure on the cardiac side of the tumour.* The artery may be here compressed by the aneurism itself; it having enlarged chiefly in that direction, and being bound down on the vessel by fibrous investments. The arterial flow to and into the cyst is consequently moderated, and the occurrence of solidification favoured. Or similar pressure, with similar effects, may be exerted, not by the original tumour, but by the formation of another aneurism in the cardiac proximity. The cure of one disease by the establishment of another. Thus, for example, a subclavian aneurism has been cured by the pressure of a nascent tumour formed on the *arteria anonyma*. But perhaps, indeed, it were an error to apply the term cure to such an event. A more favourable result is the third variety of pressure, when a tumour, not aneurismal, and unconnected with the vessel—perhaps an enlarged gland—compresses the artery, or artery and aneurism both, so as to induce coagulation in the cyst. The principal disease is cured, and the secondary formation, the independent tumour, may be dealt with afterwards, if necessary. 2. *By occlusion of the aperture of communication,* independently of pressure or moderation of the arterial flow. A firm portion of coagulum becomes detached from the fibrinous mass occupying the interior of the cyst, and is impacted in the aperture, either preventing or greatly limiting the arterial influx, and obviously favouring contraction and solidification of the tumour.

The artery itself may remain pervious or not; more frequently it also is occluded. To this result it is plain that a smallness of communicating aperture is very favourable, and were we at all times able, by auscultatory and other signs, to ascertain the dimensions of the aperture, we might more truly predicate, in those cases of internal tumours which are inaccessible to surgical interference, the result of treatment with the view of obtaining spontaneous



Fig. 21.—Aneurysm. by dilatation. The abnormal space almost entirely filled up by fibrin; the arterial canal remaining clear. Spontaneous cure in advanced progress.—*Miller.*

cure. 3. *By inflammation and gangrene of the cyst*, not partial, but including the whole. Gangrenous inflammation of the aneurismal cyst may occur spontaneously, or be the result of external injury. It may follow ligature of the artery, and then it not only involves the diseased formation, but includes the whole limb as well, demanding amputation.

" But with this we have nothing to do at present, treating not of the surgical but of the spontaneous cure. If the slough include the whole cyst and spread no further, a fortunate issue may be predicated. The dead part separates in the usual way, but not until the surrounding living textures have become densely infiltrated by fibrinous exudation, and not until by such plastic exudation all the implicated bloodvessels, including the artery at the aneurismal part, have been consolidated. As the slough separates, consequently no hæmorrhage ensues, and healing advances in the ordinary way.

" Profusion of purulent formation is the principal danger, when the suppurated part is large, and the patient already low in system. Hectic may ensue. If gangrene be but partial, however, and do not involve the whole cyst, there is the greatest hazard. On separation of the slough the open cyst and artery will be exposed, hæmorrhage will be great, and probably fatal. 4. *By the aneurism becoming diffused.* If suppuration or gangrene do not occur, the pressure of the diffusely infiltrated blood on the cardiac portion of the artery may so restrain its flow as greatly to favour the occurrence of spontaneous cure. 5. *By obliteration of the artery on the distal aspect.* The aneurism, by making especial pressure there, may in truth effect a result similar to that of Brasdor's operation. The vessel may be gradually and finally shut up, and if no collateral branch intervene between the occluded part and the opening into the aneurismal cyst, cure will follow.

" II. *The Surgical Treatment.*—Spontaneous cure, by any mode, is comparatively of rare occurrence, and is not to be trusted to in practice when other means are in our power.

" Success depends mainly on a skillful use of the ligature, and too much caution cannot be used in its application. The vessel is exposed by careful dissection somewhere on the cardiac side of the aneurism, not so close as to endanger the encountering of degenerated coats, not so far removed as to favour too free a collateral supply of blood still remaining to the tumour. The external wound should be rather too large than too small; facility and safety of performance being closely allied in this operation. The incisions are made with a small finely-edged scalpel, used lightly.

" Neither directors nor blunt knives should be employed, for they must bruise and tear to a certain extent, and the simpler and

smoother the cut is, the greater is the probability that both wound and artery will assume a salutary action. The vessel having been exposed, its sheath, pinched up by dissecting forceps, is opened to the extent of about half an inch, and by repeated touches of the knife's point, assisted by forceps, the arterial coats—looking at last white by the insulation—are completely detached from all neighbouring tissues; only, however, to a very limited extent, not more than what is barely sufficient for the passage of the needle and ligature. The aneurism-needle should have its point neither too sharp to endanger wounding of the arterial coats, nor too blunt to enable tearing and force necessary for its passage. Armed with a firm, round ligature of silk or thread—well waxed to facilitate application—it is gently insinuated beneath the artery at the detached point, great care being taken to exclude all textures, save the arterial, from within its circuit, more especially nerves and veins. Having passed, the ligature is laid hold of and retained, while the needle is withdrawn. The loop of the ligature is then cut, and one half pulled gently away. The remaining portion is secured on the vessel with a reef-knot, drawn with such tightness as affords to the operator's fingers the peculiar sensation of the internal and middle coats having given way. One end is cut off close to the knot, the other is left pendent. The wound is brought carefully together by suture and adhesive plaster, leaving the protruding end of the ligature readily amenable to both sight and touch, and is treated so as to promote adhesion. The limb is placed in a relaxed and comfortable position, and so retained.

"The ligature is not interfered with until the usual period for its separation has elapsed—from ten to twenty days. Then its free extremity may be gently touched. If found loose in its deep part, it is carefully withdrawn; if still adherent, no pulling is employed: we await patiently spontaneous loosening, and as in the case of dead bone, regard it as our duty to interfere and take away only when the natural process of detachment has been completed.

"By some it has been considered preferable to employ two ligatures, dividing the artery between; a modification in the delegation of arteries as old as Aetius, and strenuously advocated by Abernethy. Various points may be stated in favour of this mode of operation. The artery retracts freely and thereby thickens its parietes, while

it contracts its calibre; the ligature is brought into close contact with healthy structures, and consequently there may be less chance of suppuration, ulceration, and hæmorrhage. Besides, it has been thought important, especially in the case of the carotid, to avoid the double impulse which a single ligature has to sustain, the one direct from the heart, the other dependent on the collateral circulation.* Most certainly, if the ordinary operation have been improperly conducted, that is, if in our attempts to expose the vessel cleanly, it have been detached too extensively from its surrounding connexions, thereby rendering the occurrence of either ulceration or sloughing more than probable, let two ligatures be applied, one at each extremity of the separated portion.

"The main object in conducting the operation and subsequent treatment is, in truth, maintenance of a low grade of the inflammatory process and prevention of true inflammation; attainment of plastic deposit, and the averting of suppuration and ulceration, except what barely suffices for separation of the ligature and its included slough."—*Miller*.

Various other methods of treatment have been practised, viz., *Brasdor's* operation, ligaturing close to the tumour on its distal side; temporary ligatures, thick and flat ligatures, pressure without incision, the application of cold continuously, the insertion of a seton, galvanism by acupuncture, etc.

Casualties.—In the event of secondary hæmorrhage, which may be induced by sloughing of the vessel, ulceration, or abscess, the artery, if possible, must be re-tied, and external pressure applied.

DEGENERATIONS OF ARTERIES.

As a matter of pathological interest I quote the following forms and nature of arterial degeneration from Gant's "Science and Practice of Surgery:"

"The degenerations to which arteries are subject are of three kinds: *cartilaginous*, *atheromatous*, and *ossification*. These deteriorative alterations of structure differ in at least five important

**J. Chassaignac, Gaz. des Hôpitaux*, Nov. 30, 1848.

particulars: the kind of matter deposited; its seat, with regard to the arterial coats; and the appearances presented; the changes which take place in the deposit, and in the arterial coats, with corresponding alterations of appearance; the vessels which are principally affected in the arterial system.

"1. *Cartilaginous Degeneration*.—Cartilaginous patches are apt to form on the free surface of the inner or membranous coat lining the arteries, partly in the aorta and large vessels, especially at the offset of branches, but principally in the smaller arteries, where these patches are more frequent and numerous. Commencing in the form of a substance having a semi-fluid or gelatinous consistence, and a pale yellow or reddish colour, this exudation from the membrane, or perhaps deposit from the blood-stream, appears as a layer of greater or less extent upon the inner surface of the artery. With any such gelatinous layer may be associated other deposits, in which the substance is more consistent, white and opaque, like boiled white of egg; and others, again, which present the appearance of cartilaginous patches. There seems, then, to be a gradual transition from the former to the latter or more complete condition of this degeneration. The lining membrane of the artery becomes so adherent to, or identified with, these patches, that they may be said to lie in contact with the middle coat. Certain changes may take place in connection with the cartilaginous plates. When several such plates are grouped together they become overlaid with a thin, pellucid membrane, as if a layer of the inner membranous coat was continued over them. The walls of the artery are thickened and less elastic, and the inner surface of the vessel, retaining its polished appearance, is finely puckered. Occasionally a cartilaginous plate may become partly detached, and thus approach to the formation of a breach of surface—an ulcer; while the projecting eminence within the artery offers a nucleus for the gathering around of fibrinous deposit from the retarded blood-stream. But the cartilaginous patches are never subject to any intrinsic change by softening or ossification. Such, at least, is the result of Hasse's observations; Andral and other pathologists have recognized the change of ossific transformation.

"*Atheromatous, or Fatty Degeneration*.—Atheromatous matter is originally seated between the internal and middle coats of the artery affected, or partly between the muscular fibres of the latter

tunic, appearing in the form of patches of a yellowish-white colour, and opaque, flattened, or slightly elevated, and fairly defined in outline; thus presenting a different aspect from the inner surface of the artery in other portions of its extent. Even so abundant may be the atheromatous substance as to form lumpy protuberances within the artery. The aorta and large-sized arteries are mostly subject to this kind of degeneration. As age advances from mid-life, or earlier, some such atheromatous patches may be found after death from any cause. The atheromatous matter consists of fat-particles, with scales of cholesterine and amorphous granules, having a variable consistence, from that of firm putty to pultaceous or puriform matter. This fatty deposit, or educt of degeneration, is very liable to either of two dangers of opposite character—softening and liquefaction, or hardening into an ossific deposit. Disintegration of the middle and internal coats of the artery accompany either of these two transformations.

“*Softening* of the atheromatous matter is attended with disintegration of the middle coat of the artery, which gradually loses its fibrous texture, becoming friable and of a yellowish colour; then the inner membrane of the vessel disintegrates, cracks, and at last disappears, forming an *ulcer* corresponding to the former atheromatous patch. The ulcer which results from these destructive changes is set in the artery, its base being the external cellular coat, with any remains of the middle tunic; it has thus an uneven surface, while the edges are flattened and ragged. The softened atheromatous substance having escaped and been washed away by the blood-stream, the artery, attenuated at the spot of ulceration, is exposed to the force of the current, beating on the bare external coat. Aneurismal dilatation would invariably ensue, or perforation of the artery, with sudden, and perhaps fatal, internal hæmorrhage. But the external coat, always vascular, acquires even greater vascularity, and becomes thicker and stronger, offering a more resisting support, as the atheromatous degeneration pursues its destructive course. The other two coats do not share in this compensatory adjustment to the impinging force of the blood-current. No vascular development in these membranes besets the ulcer; its margins and base acquire a deep grey or blackish colour, while around the circumference small fibrinous clots are gathered from the blood, and disposed sometimes in stratified layers, accumulating yet more

and more. Rarely, an atheromatous ulcer heals ; the inner surface of the artery is then marked with a black depression in a puckered cicatrix, leaving the artery, however, weak at that spot. Ulceration occurs more commonly in the aorta, particularly in its abdominal portion ; rarely in the second and third-sized arteries.

" *Ossification or Calcareous Degeneration, Calcification, Cretification.*—This kind of degeneration may be consequent on the atheromatous, or it may occur independently.

" (α). As a sequel of atheromatous degeneration, ossific transformation of the arterial texture consists of thin scales having a brittle consistence and pale yellow colour. They are seated between the inner and middle coats of the artery, and, lying immediately beneath the inner membrane, these scales look what, indeed, they are, ossified atheromatous patches, and can be readily felt in the walls of the vessel between the thumb and finger, giving a thickness and rigidity to the substance of the artery. In this form the degeneration is sometimes named *laminar ossification*. But the deposit is not truly ossific in the sense of having the structure of bone ; that would imply a development, and to a high degree, of structural formation, quite opposed to the nature of structural degeneration. The quasi-ossific deposit consists, as Valentine and others have shown, of earthy particles having a round, annular, or irregular shape, with radiating prolongations, this earthy or cretaceous matter being set within a pellucid, somewhat laminated, and finely granular organic texture. The scales thus constituted thicken and extend, with disintegration and disappearance of the fibres of the middle coat ; while the inner membrane, adherent to the scale, cracks at the centre, and perhaps at last wastes away, thus approaching to the state of atheromatous ulceration within the artery. The bony scale becomes loosened and partly detached from the remnant middle coat ; in this state, or perhaps enlarged to a rough eminence, it may project within the vessel, more or less obstructing the canal, and gathering fibrinous coagula from the impeded blood-current. In this way an artery becomes partly *occluded* as well as *contracted* or narrowed by increasing thickness of the adjoining parietal deposit, forming a more or less rigid and inelastic tube. Thence, probably, the origin of a general or circumferential *dilatation* of an artery under the constantly expansive force of the blood-stroke, as in the aortic arch ; but at any spot

weakened by an upturned bony scale within the vessel, there the artery is liable to true *aneurismal dilatation* into a sac, or there spontaneous *rupture* may occur.

"(b). Ossification taking place independently of previous atheromatous deposit differs in some particulars from that already described. This second form of the degeneration was clearly defined by the observations of Andral and Lobstein. The ossific or cretaceous matter, consisting of phosphate and carbonate of lime granules, is still deposited betwixt the inner and middle coats of the artery, but invading the latter tunic, which has lost its fibrous texture, owing to disintegration and atrophy. The inner surface of the vessel, therefore, assumes a dotted and rough granular appearance, while the walls feel somewhat rigid and inelastic. Arteries of the second and third size are chiefly affected with this form of ossification. The changes which the deposit passes through are also peculiar. The inner membrane of the artery rarely becomes involved. But the granular matter may be disposed in transverse streaks, at length forming complete rings around the interior of the vessel, sometimes named annular calcification. Then the artery may acquire an alternately constricted and dilated condition; the enlargements corresponding to the intervals between the rings, and where the walls are thinned by the atrophic disintegration of the middle coat, without the support of the substituted ossific deposit. Sometimes, by coalescence of closely-arranged adjoining rings, the artery becomes converted into a rigid, inelastic tube; as may also occur more often, from the conjunction of bony scales, in the other form of ossific degeneration; and this change of appearance has been named *tubular* calcification. Another and very rare form of the deposit is described by Bizot, in which the calcareous granules are disposed in linear direction upon the inner membrane of the artery; primarily, in elliptical groups, afterwards having the shape of irregular scales. They seem to originate in transverse cracks of the inner coat, which gather the cretaceous granules around their edges.

"The *different kinds* of degeneration—the cartilaginous and the atheromatous—are not unfrequently found associated, and in the same artery; and with atheroma, or where softening is taking place in one patch, there may be ossification co-existing in another and neighbouring patch. Hence the varied appearances which an

artery or the arterial system may exhibit, when examined in states of degeneration.

"The *relative frequency* of degeneration, in its different forms, varies, however, in different arteries. This diversity has already been noticed. Commencing with the aorta, this parent trunk is the chosen scene of these deteriorative and destructive changes in the arterial system. Chiefly affecting the posterior surface of the aorta, and where branches are given off, degeneration extends downwards, through the thoracic and abdominal portions of the artery. Ossification, as affecting different arteries, proceeds in the following order of frequency, according to Lobstein's arrangement: 'Arch of the aorta, end of the common iliac artery, thoracic aorta, splenic artery, abdominal aorta, femoral artery and its branches, spermatic artery, hypogastric and its branches, coronary arteries of the heart, branches of the subclavian, bifurcation of the common carotid, the cerebral carotid, branches of the external carotid arteries of the thoracic and abdominal walls, brachial artery and its branches, twigs of the umbilical, arteries of the substance of the brain, pulmonary artery.' If this order of procedure be taken as an approximation to the truth, it will at least tend to correct the apparently arbitrary selection which is sometimes assigned with regard to different arteries, respecting their liability to ossific degeneration.

"The *symmetrical distribution* of arterial degeneration, on both sides of the body, may be accepted as an almost invariable law, as shown by Bizot.

"*Causes.*—The originating cause of degeneration, as affecting the arterial system, is obscure, and cannot be discussed here with much practical advantage. In whatever form degeneration may appear, it is a manifestation of declining nutrition, with disintegration and atrophy of the natural texture elements, and the substitution of a new material, of a lower organization, or perhaps merely inorganic; thus resulting in a transformation which is incident to advancing life, or which may occur prematurely. Age, therefore, implies a natural predisposition to degeneration. This change becomes more frequent and extensive, and the various retrogressive transformations become more complete, in proportion to the age of the individual, from mid-life downwards."

Plate 8.



FIG. 22.

CEPHALIC ARTERY TWELVE WEEKS AFTER LIGATION
WINTOUR.

ARTERIAL INJURIES.

The injuries to which the arteries of the lower animals are subject, are usually those arising from pricks, cuts, lacerations, and contusions. Those most frequently injured are the palatine, temporal, carotid, metacarpal branches of the femoral or gluteal, and metatarsal.

Treatment.—This consists in ligature, torsion* or pressure, the object in either procedure being to establish the formation of a clot which acts as a plug, and eventually becomes adherent to the arterial coats. In the case of hæmorrhage from the metacarpals I have found a wine-cork, placed lengthwise over the part and firmly secured by bandage, answers the purpose admirably.

Arterial bleeding is denoted by the forcible jerking stream of bright blood.

"When an artery has been tied, attention must be paid to the separation of the ligature, which may be attended with such an amount of ulceration as to open the bloodvessel, and cause it to bleed freely. This is called secondary hæmorrhage, which is very rare in the lower animals, and must be treated by ligature again."—*Gamgee.*

In Professor Spence's published "*Lectures on Surgery*," some excellent coloured illustrations of the effect of ligaturing arteries are given. In Fig. 22 will be observed the wonderful provision nature makes for the continuation of the arterial current when the main course has been interrupted.

VENOUS HÆMORRHAGE.

Veins are liable to the same injuries as those just described as occurring to arteries, but the danger arising therefrom is not so great owing to the rapid formation of a clot around the wound and the speedy healing of the external one.

* The value and safety of torsion is indisputably shown in the operation of castration, in which I practise it in preference to any other method.

Ligature is not applicable to veins. The cutaneous wound simply needs pinning securely, or bandaging.

AIR IN THE VEINS.

In venesection care should be taken, immediately the vein is opened, that firm pressure below the orifice should during the abstraction of blood be continued, otherwise air is likely to enter the vessel and give rise to serious results.

Symptoms.—"A gurgling sound is heard, the animal immediately staggers, roars, falls, and soon dies in considerable agony, as if suffocated, and in violent convulsions. The symptoms are more severe than if air is blown into the veins, whereby a large quantity passes in at once, and kills almost instantaneously."—*Gamblee*.

The mode of death is as follows:—The blood, become mingled with air, assumes a frothy character in the right ventricle; it is sent through the pulmonary artery, but becomes more or less arrested in the pulmonic capillaries in consequence of the right ventricle being unable to overcome the mechanical obstacle presented by air-bubbles in these vessels. The quantity of blood transmitted through the lungs for the systematic circulation grows less and less according to the increase of obstruction and arrest of the blood in the capillaries of the lungs. The supply to the head is inadequate to afford due stimulus to the nervous centres, and syncope results. If circulation be not restored, this continues; the respiratory movements then cease, and life becomes extinct; the heart last failing in its action from want of its necessary stimulus—the blood.

"From some experiments made by me and one of my pupils (Mr. Hutcheon), it was found that some of the air was eliminated into the areolar tissue of the lungs, constituting interlobular emphysema, and that the inspiratory movement was performed with greater difficulty than the expiratory."—*Williams*.

The Cause.—"Owing to the tendency to the formation of a vacuum in the pericardium during inspiration, there is, during that process, a suction-action, called by some 'venous inspiration,' in the veins within and near the thorax, extending to a limited

extent only, and ceasing where the coats of the veins collapse. The space in which this suction-action exists is that in which the venous flux and reflux are perceptible. Accordingly, it is found that the accident has always occurred when veins have been opened in the cervical and brachial regions."—*Spence*.

Treatment.—When such an event has occurred, pressure beneath the wound should be applied until the blood flows freely, and then, after a few moments, the external wound should be securely closed with a pin, around which some tow should afterwards be wound. Stimulants may also be administered; "and if the animal falls, he is to be kept in the recumbent position; frictions are to be applied to the extremities; and should the urgent symptoms pass away, the treatment is to be conducted with the view of preventing the occurrence of inflammation of the lungs, a sequel which, experience has shown, is apt to ensue."—*Williams*.

RUPTURE OF THE VEIN.

In the smaller branches a rupture is not of serious moment, but it occasionally happens that the larger vessels become severely lacerated or torn asunder. The following case occurred in my own practice:

On the 29th of August, 1879, I visited a cow at Bloxwich, belonging to J. Bealy, Esq. She had caught the jugular vein on a gate-hook, severing the vessel. There was a large irregular wound at the inferior portion of the neck, on the right side, near to the thorax; hanging out of the orifice were some five or six inches of the lower end of the jugular vein, which, being plugged with a coagulum, presented much the same appearance as a piece of india-rubber gas-tubing. The superior portion, which was not visible but could be easily felt, was also plugged. A considerable amount of blood had been lost, the hæmorrhage being chiefly interstitial, and in the brisket, which had a heavy, dropsical appearance. A butcher was already there awaiting my verdict, Mr. Bealy fearing that the bleeding might recommence, and death result. But from the plugged condition of the severed ends of the jugular, I did not apprehend secondary hæmorrhage, and as there was only

the necessity of administering restoratives after such excessive depletion, with the removal of the accumulated blood in the brisket and judicious treatment of the wound, I very confidently undertook the management of the case. Of course the function of the jugular on that side was destroyed, as it is when obliterated in other animals; but this in cattle is of little moment, particularly in feeding-stock. I replaced the portion of the vessel hanging out within the wound, ordered diffusible stimulants, and hot fomentations to the brisket. In a few days the wound smelt very offensive from the breaking of blood-clots. A stimulating liniment, with carbolic acid, was injected, which remedied this, and promoted a healthy discharge. The animal was quite well in a fortnight.

THROMBUS.

The term *Thrombus* literally signifies a blood-clot, and correctly speaking applies to the formation of a clot inside a bloodvessel. It is, however, also applied to the extravasation of blood in the areolar tissue surrounding the wound, and is usually caused by the surgeon drawing the skin a considerable distance out when closing the incision. It also occurs from laceration of the vessels, or by pressure on them through the formation of tumour or by compress. It is usually associated with exhaustive diseases, particularly hæmorrhage, pneumonia, phthisis, endocarditis, purpura, and anthrax.

Treatment.—This will depend upon the cause. If due to the first-named, "no bad consequences follow if the opening be closed, a cold wet sponge held to the part for a short time, and the animal's head tied to the rack" (Williams). When arising from the latter cause, removal of the obstruction is indicated.

PHLEBITIS.

Inflammation of a vein is not so frequently seen in the ox as in the horse. When met with, it is usually the jugular vein that is affected, and the disease is generally due to carelessness or clumsi-

ness in bleeding, the use of a dirty or rusty instrument, or from the animal rubbing its neck afterwards. Inflammation of the jugular vein may be either idiopathic or traumatic, adhesive or suppurative.

"The coats of an inflamed vein have a dark-red colour, and have become thickened and pulpy, owing to an interstitial fibrinous exudation; the inner coat, in particular, presents this hue—partly due to the imbibition of colouring matter from the blood, and a lamella of lymph is adherent to the surface. The blood within the vessel has undergone coagulation, more or less perfectly, forming a hard or soft blackish coagulum, mingled with the fibrinous exudation. Thus far phlebitis is *adhesive*. But pus being readily secreted within the vessel, *suppurative* phlebitis may soon be established. If limited within the boundary of the coagulum and fibrinous exudation above and below—the pus lying between the coats of the vessel and the coagulum, and between interrupted portions of the coagulum—this circumscribed form of suppuration has been named *limited* suppurative phlebitis. And as the matter thus secluded or imprisoned cannot be transmitted into the general circulation, this condition is not productive of pyæmic infection. But if the plastic lymph-barriers within the vessel, above and below these collections of pus, give way, *diffuse* suppurative phlebitis ensues, and pyæmia will be inevitable. This interpretation of systemic reflection may, however, perhaps be abandoned in favour of more recent views relative to the pathology of pyæmia.

"*Diffuse* phlebitis signifies a spreading form of the disease, but as this character is probably never unaccompanied by suppuration, the distinction seems unnecessary.

"The *Symptoms* of phlebitis are referable both to the vessel or vessels affected, and to the circulation in the part below. An inflamed vein is hard, cord-like, and knotted under the finger, painful or tender on pressure, and a purplish redness, with some degree of heat, may be perceptible in the course of the vessel. If the vein be varicose—a pre-existing condition not uncommon—these symptoms will be even more marked, and those of varix are superadded. The supervention of *suppuration* is denoted, in the limited or circumscribed form, by the symptoms of abscess in exchange for those of purely adhesive phlebitis. One or more small fluctuating swellings appear in the course of the vein, instead

of its previously uniformly hard, cord-like character, which thus becomes more knotty—hard here, and softened there. In the *diffuse* form of suppuration the whole tract of the vessel softens down uniformly; fibrine, coagula, and pus commingling."—*Gant*.

When the jugular vein is the seat of disease, the thickening of the coats of the vessel is so considerable as to be not only plainly felt through the skin but very frequently visible externally, as an irregular tumefied mass which is hot and exceedingly painful; and unless active and judicious remedial measures are taken, abscess speedily supervenes, and pyæmia from the entrance of pus in the blood may result, and death soon follow. When phlebitis follows venesection, "an ichorous discharge oozes from beneath the tow or hair used to twist round the pin, and not unfrequently there is considerable constitutional irritation. If the pin is removed at once, the wound is found open, red, moist with purulent matter and very irritable. There is a tendency to hæmorrhage, and at other times to conglutination of blood in the jugular upwards towards the head, for the blood becomes stagnant up to the first large collateral branch."—*Gamgee*.

Obliteration of the vein almost inevitably follows phlebitis, but the loss of the vessel is not of very serious import in cattle.

. VARIX.

Varix or varicosis signifies an enlarged, irregular, knotted or tortuous condition of the veins. The enlargement is usually most prominent at the point of the valves, the latter of which become wholly or partially destroyed. The coats of the varicosed vessel are sometimes attenuated, and at others considerably thickened.

Causes.—Obstruction to the return of blood, as in enlargement of the uterus in pregnancy, hence its more frequent occurrence in females. Disease of the liver, rectal distension, fractures, and continual standing also operate in producing varix. Venous degeneration has likewise been described as a provocative condition.

Course and Terminations.—Inflammation of the vein, œdema, varicose ulcer, venous hæmorrhage.

Treatment.—"A spontaneous cure may result by accession of fibrinous phlebitis in the affected veins, their canals becoming con-

solidated, and constituting a hard indolent swelling, which, by absorption, ultimately disappears. The blood finds another outlet by a collateral route. Like the spontaneous cure of aneurism, however, this is not sufficiently frequent to allow of its being trusted to in practice. Cure must be sought, not merely hoped for. It may be palliative or radical.

"1. *Palliative*.—Bearing in mind what was formerly stated regarding the propriety of not unnecessarily interfering with the venous tissue by operation, and also remembering that varix is in most cases rather a deformity and inconvenience than a disease of itself dangerous to life, it will be readily understood how this mode of treatment should be regarded as the more generally applicable. It consists in removal of the cause, and in affording support to the dilated veins. The rectum is emptied and kept habitually clear by suitable laxatives, and if other compressing agents are in force, they too must be removed so far as may lie in our power. In the case of pregnancy we must patiently wait for the natural relief by parturition. If hepatic derangement be indicated, the suitable remedies must be employed.

"2. *The Radical Cure*.—This depends on effecting obliteration of the affected veins. They may be directly incised and compressed. Suppuration of the wound necessarily follows, and if it heal kindly by granulation, obliteration of the venous cavities will doubtless be obtained. Or a portion of the vein may be excised, and pressure may be applied to each cut extremity so as to restrain bleeding and favour fibrinous occlusion. Or the vein may be cut down upon and encircled by a tightly-drawn ligature, as if it were an artery. All these three modes are doubtless perfectly equal to the obtaining of the desired oblitative result; but ample experience has shown that the inflammatory process seldom ceases short of suppurative phlebitis, and that this not unfrequently assumes its worst and most dangerous aspect.

"If incision be attempted at all, it ought not to be direct, but by the oblique and subcutaneous method of puncture; so as, if possible, to avoid inflammation and suppuration in every part of the track of the wound. Pressure is required afterwards to restrain the escape of blood and prevent infiltration of texture. Let not this be severe; a very moderate degree, if applied and maintained with accuracy, is sufficient to arrest venous flow; and severity coming

after wound is certain to induce what we wish to avoid—true inflammation. This method was at one time practised by Brodie, but with indifferent success. Now that the principles of subcutaneous section are better understood, the execution might be more skilful, and the issue more prosperous. But still two difficulties must remain: first, the risk of over-action and danger to life thereby; second, the chance of speedy healing of the wound, the vein at once uniting and resuming its unbroken flow just as before the operation.

"Modern experience and opinion are decidedly in favour of two other modes of treatment: cauterization and application of the twisted suture. The most convenient mode of applying *caustic* is in the form of what is termed *Vienna paste*—equal parts of quicklime and potassa fusa. An incision is made through the skin over that part of the vein which we wish to obliterate; and a few minutes are permitted to pass unoccupied that capillary oozing of blood may cease. Then, the surrounding textures having been protected by a piece of lint with an aperture in its centre—the aperture corresponding to the exposed part of the vein—a portion of paste is applied in contact with the venous tissue, and there retained, either permanently or only for a time, according to the size of the portion applied and the extent to which we wish to make the eschar. The object is to produce a complete slough of the venous coats, to be followed by a surrounding areola of sthenic inflammatory process, giving fibrinous exudation, whereby the venous canal may be obstructed permanently for some distance above and below the cauterized point. And then the suppuration and ulceration necessary for detachment of the slough are not likely to extend beyond the mere vicinity of the dead part.

"This cauterization may be employed in two ways. It may be applied to a sound part of the great venous trunk above the varicose branches; to the saphena in the thigh, for example, in the case of varix of the leg; pressure being at the same time used to the dilated veins. The effect of obstruction above is expected to be that the blood will seek another channel—collateral, or in a deeper plane, and that consequently the affected veins, much disburthened, and now comparatively idle conduits, may have an opportunity either of recovering their calibre and tone or of being obliterated by consolidation. Or the caustic may be applied to the

dilated veins themselves at various points, so as to ensure obliteration."—*Miller*.

An antiphlogistic course of treatment should follow surgical measures—with strict quietude.

Professor Williams observes: "The veins of the extremities of horned cattle present varicose dilatations along their course in the form of sacculated or knotty protuberances on various parts of the vessels. The contained blood is at first in a fluid state, but an alteration not unfrequently occurs, the blood coagulates, and the vessel becomes obstructed.

"The formation of these coagula is an effect of inflammation in the coats of the vein; this inflammation may be slight, or it may run on to suppuration, giving rise to small abscesses. I have repeatedly met with this form of phlebitis in cattle underfed and kept in wet cold situations. It seems to arise from debility of the circulation and relaxation or want of tone in the coats of the vessels.

"The treatment for dilatations without inflammation: Better food, warmth, and comfort; tonics, and pressure by bandages; and, in addition, when suppuration is established, the abscesses are to be opened and blisters applied, but no pressure.

"If a large varix, without any tendency to inflammation and formation of a clot, should be met with by the veterinary practitioner, the vein is to be obliterated; and the method at present adopted is to introduce two needles, one above and one below the dilatation, kept in these positions by a thread tied around them, so as to cause mediate pressure on the venous coats. The needles are not removed, but allowed to ulcerate their way through. Care must be taken not to introduce the needles into the vein, but underneath it, so as to ensure that the circulation is absolutely cut off."

CHAPTER V.

DENTITION : DISEASES OF THE TEETH, JAWS, TONGUE, AND MOUTH.

Caries.—Osteo Sarcoma.—Glossitis.—Glossanthrax.—Induration of the Tongue.—Paralysis of the Tongue.—Pharyngitis.—Pharyngeal Abscess.—Pharyngeal Polypi.—Salivation.—Stomatitis.—Thrush.—Mechanical Injury to the Mouth.

DENTITION.

THE dentition of the ox is an important study both to the veterinarian and agriculturist. The horns, which are most frequently taken as the indication of age, are liable to be tampered with, and the inexperienced are thereby often misled. The teeth, however, the truest criterion we can go by, are not thus dealt with by cow-sharpers. The following table by Professor Simonds is perhaps the most trustworthy :

TABLE OF EARLY AVERAGE IMPROVED BREEDS.			TABLE OF LATE AVERAGE IMPROVED BREEDS.			TABLE OF LATE AVERAGE UNIMPROVED BREEDS.		
Yrs.	Mo.	NUMBER OF TEETH.	Yrs.	Mo.	NUMBER OF TEETH.	Yrs.	Mo.	NUMBER OF TEETH.
1	9	2 permanent incisors	2	3	2 permanent incisors	2	3	2 permanent incisors
2	3	4 ditto	2	9	4 ditto	3	0	4 ditto
2	9	6 ditto	3	3	6 ditto	4	0	6 ditto
3	3	8 ditto	3	9	8 ditto	5	0	8 ditto

Chauveau observes: "The teeth of the ox are thirty-two in number, twenty-four of which are molars, arranged as in the horse, and eight incisors belonging to the lower jaw. The latter are replaced in the upper jaw by a thick cartilaginous pad, covered by the mucous membrane of the mouth; this pad forms the gum, and

furnishes a bearing for the incisors of the lower jaw. Sometimes, as in the horse, there are found supplementary molars, which, if four in number, will make up the whole to thirty-six, though they are never all present at one time, as the supplementary ones are shed before the molar dentition is completed.

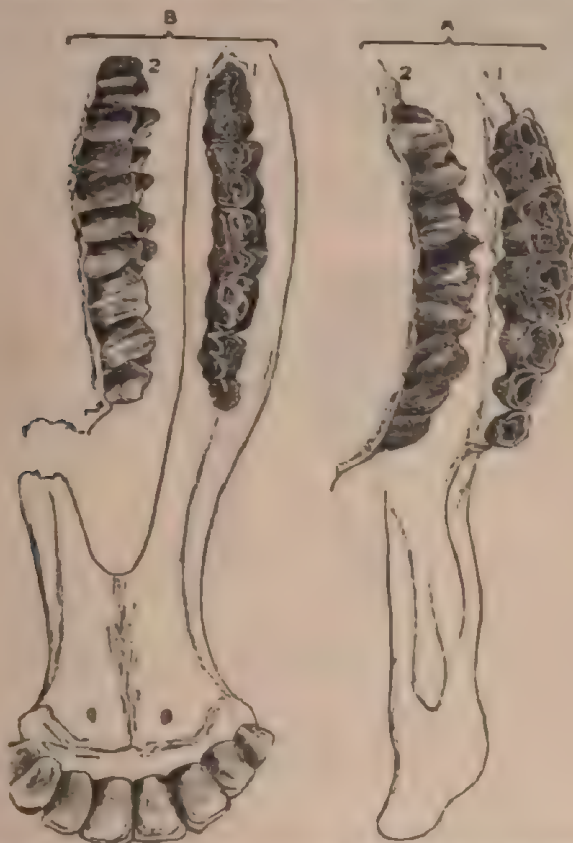


Fig. 23.—The Teeth of the Ox : 1. Upper jaw with *a*, the friction surface, and *b*, the external surface ; 2. Lower jaw, with *a*, the dental tables, and *b*, the external face.—*Chauveau*.

"The composition of the ox's teeth is the same as those of the horse, the only difference being in the arrangement of the several substances.

"*Incisors*.—The incisors, eight in number, are placed *en clavier* (like a keyboard) at the extremity of the kind of rounded shoulder-

bone by which the maxillary bone terminates, forming around this point a perfect circle when they have acquired their full development.

"Instead of being fixed in the alveoli, as in solipeds, they possess a certain degree of mobility, sometimes mistaken for a diseased condition. This is necessary, in order to prevent their wounding the cartilaginous pad of the upper jaw, against which they press. They are divided, according to their position, into two *pincers*, two *first intermediates*, two *second intermediates*, and two *corner incisors*.

"Each incisor offers for consideration two parts: one free, the other encased, constituting the root, and separated from one



Fig. 24.—Ox's Incisor Tooth: 1, free portion, external face, outer border; 1', *ibid.*, external face, outer border; 2, root; 3, neck; 4, anterior border; 5, 5', inner border.—*Chauveau*.

another by a very marked constriction—the neck. This arrangement gives to the tooth the form of a shovel, the root representing the handle. (Fig. 24.)

"The free portion, flattened above and below, and thinnest and widest towards its anterior extremity, presents two faces—an inferior or external, the other superior or internal; with three borders, an anterior and two lateral.

"The external face, slightly convex, and milk-white in colour, is covered with fine, undulating, longitudinal striae, which disappear with age and leave the surface beautifully polished. (Fig. 24, 1.)

"The external face, flatter than the preceding, presents in its middle a slight conical eminence, whose base widens, and is termi-

nated near the free extremity of the tooth, while its sides are circumscribed towards each border by a well-defined groove. (Fig. 24, 1'.)

"The two lateral borders (the internal slightly convex in its length, the external slightly concave in the same direction) make the free portion appear as if thrown outwards. The anterior border is sharp and slightly convex from one side to the other; it is the first part of the tooth destroyed by wear.

"The root is rounded, slightly conical, and implanted in an alveolus of the same form; in youth it shows at its extremity an opening communicating with an internal cavity analogous to that in the teeth of solipeds, and prolonged into the interior of the free portion. (Fig. 24, 2.)

"In the virgin tooth the enamel forms around the free portion a continuous layer, thinnest on the internal surface, and extending very scantily over a part of the root.

"The dentine composes the remainder of the organ, and the (pulp) cavity, which is originally a large space of the same form as the tooth, is filled, as the animal grows old, by new dentine, which, as in the horse, has a yellower tint than the primitive ivory.

"When the cavity is completely filled the tooth ceases to grow, and is not pushed beyond the alveolus during wear like the teeth of the horse.

"The incisor tooth has scarcely arrived at its perfect development before it begins to be worn. Its horizontal position, and its coming in contact with the pad on the upper jaw, exposes the anterior border and superior face to friction and consequent wear from before to behind. The wear therefore chiefly affects this upper face, which really forms the table of the tooth, and which Girard designated the *avale*. When use has worn away the conical eminence, and the grooves bordering it, the tooth is *levelled*.

"As wear goes on, there appears at first, and at the extremity of the tooth, a yellow band, which is the dentine denuded of its enamel; and later, in this ivory a yellower transverse band shows itself. With increase of wear this contracts, then widens, and finishes by forming a mask nearly square, and then round, which is nothing else than the recently-formed dentine that fills the pulp cavity of the tooth. It is a veritable dental star, analogous to that

in the horse's tooth, and varying in form according to the incisor in which it appears.

"In proportion as the teeth are used they seem to separate from one another, although they still remain in the same places. This is because these teeth, in youth, only touched each other by their extremities, and as they became worn they decreased in width, and necessarily became separated to an extent varying with their degree of wear.

"Finally, when the tooth has reached its last stage of wear, there only remains the root, the upper portion of which, becoming apparent by the retreat of the gum, stands as a yellow stump very distant from those which form with it the remains of the incisive arcade.

"The first incisors (or *milk teeth*) of the ox, like those of the horse, are all deciduous, and differ from those which replace them by their smaller volume, less width, the transparency of their enamel, and their being more curved outwards. Their roots are much shorter, and are destroyed by the succeeding teeth. The two temporary pincers are always separated by a marked interval, depending on the thickness of the fibro-cartilage in the maxillary symphysis during youth.

"*Molars*.—As in solipeds, the molars are six in each of the side jaws, but they are much smaller, and form a much shorter arcade. Their reciprocal volume is far from being as uniform as in the horse, but goes on augmenting from the first to the sixth, and to such a degree that the space occupied by the three anterior molars is only about one-half of that required for the three posterior ones; the last molar alone occupies nearly four times as much space lengthwise as the first.

"Their wearing surface, constructed on the same system as that of the horse's molars, presents eminences a little more acute.

"The arrangement of their three constituents is in principle the same as in the latter animal.

"As in the horse, the three front molars are deciduous."

Youatt observes: "The grinders will rarely be examined to ascertain the age of a beast. They are too difficult to be got at and the same dependence cannot be placed upon them. The calf is generally born with two molar teeth, and sometimes with three in each jaw above and below. The fourth appears about the

expiration of the eighth month, and the fifth at the end of the year, and so with the rest at intervals of a year; but the sixth molar, which is from the beginning a permanent tooth, does not appear until the sixth year."

In determining the age of a beast, as already observed, the horns are usually taken as the index. Variation, however, exists in comparing the rings or excrescences which form thereon with the teeth. An animal with rings very often presents a mouth indicating double that age, and in my own examinations of the horns and ears, specimens of which I have purposely collected, I cannot find one satisfactorily agreeing with the other.

A cow of my own in her seventh year having had four calves has not the least approach to a ring. Whilst on the other hand, as Youatt remarks, "the supposed rings often present a mass of confusion of which the best judges can make nothing."

With regard to the longevity of cows, the same writer says: "It is not often that the animal after fourteen or sixteen years old is able to maintain his full condition. He must then be taken up and partly fed in the house; yet there are many instances in which favourite bulls have been kept until they were more than twenty years old; and we know of a cow of the same age who pastures with the rest of the dairy, and gives a fair quantity of milk.

"Some writers have asserted that a good cow will usually continue good until that age; but the dairyman would discover his error, both in the quantity and the quality of his milk, if he received it as a general rule that a good cow will continue to breed and give milk until twenty years old. Mr. Watkinson, however, had a cow that for seventeen years gave him from ten to twenty quarts of milk every day, was in moderate condition when taken up, six months in fattening, and, being then twenty years old, was sold for more than £18. Mr. John Holt, of Walton, in Lancashire, had a healthy cow-calf presented to him, whose dam was in her thirty-second year, and could not be said to have been properly out of milk for the preceding fifteen years."

Poll Angus, a celebrated cow, the property of Mr. Watson, of Kieler, died at the age of thirty-five years and six months. She had twenty-five calves. At twenty-nine she ceased giving milk and breeding; but she did not fall off in condition until two years

before her death, and only refused her food two days before that event.

The following illustrations indicate the age by the teeth :

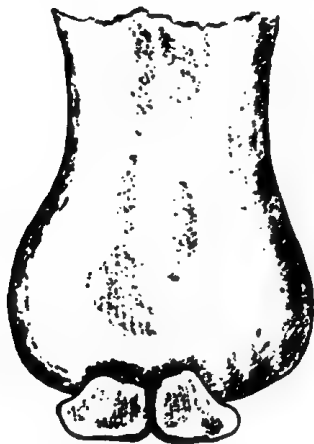


Fig. 25, birth.



Fig. 26, second week.

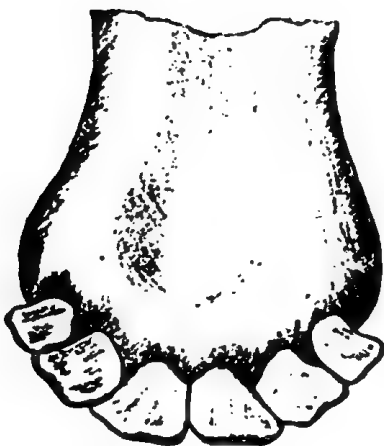


Fig. 27, third week.



Fig. 28, month.



Fig. 29, eight months.



Fig. 30, eleven months.



Fig. 31, fifteen months.



Fig. 32, eighteen months.



Fig. 33, two years.



Fig. 34, three years.



Fig. 35, four years.



Fig. 36, five years.



Fig. 37.—Six years.



Fig. 38.—Ten years.

DISEASES OF THE TEETH.

The ox is perhaps peculiarly exempt from diseases of the teeth. When caries does attack them it is usually due to disease immediately connected with their alveoli, notably that condition termed "Osteo sarcoma," or it may result from fracture or displacement. Removal in such cases is always advisable.

M. Roche Lubin, Rodez (Aveyron), records the following interesting case of extraction and malposition :

"On the 14th of April, 1837, I was requested by M. Bonhomme, near Rodez, to extract a tooth growing in the middle of the palate of his young bull. The curiosity of the thing made me hasten to comply with his request. The animal being conveniently secured, I removed the tooth in the usual way. A very considerable hæmorrhage followed the extraction of it, which was performed with some difficulty, on account of the tooth being firmly implanted in the palatine arch. It was situated at the middle of the mesian line, between the fifth alveola on the right side and the corresponding one on the left. It was precisely of the same character with the usual incisor tooth of the ox.

"This is, I believe, the only fact of the kind on record, the incisor teeth being wanting in the upper jaw of cattle."—*Le Zooiatre du Midi*, Feb., 1838.

OSTEO SARCOMA.

Osteo sarcoma signifies a tumour composed partly of flesh and partly of bone, and having an irregular surface. The interstitial structure may be cartilaginous, fibrous, sarcomatous, or cystic. The interstices are usually filled with fluid either clear or turbid. Such a tumour, when divested of its external covering and fleshy parts, presents a honeycomb appearance. The lower jaw of the ox appears to be peculiarly susceptible to this form of disease.



Fig. 39.

Gamgee observes, in treating of the diseases of the jaws : " In the ox also a remarkable condition is represented by Figs. 39, 40, due to abscess in the jaw, whereby the bone has been destroyed and the teeth displaced.

" In young cattle there is a somewhat frequent disease termed

by some veterinary writers 'Osteo sarcoma,' 'Spina ventosa,' and other inappropriate names. The only term I can give to it is fibro-plastic degeneration of bone. There is no recognised cause of the disease. It occurs most readily from two to five or six years of

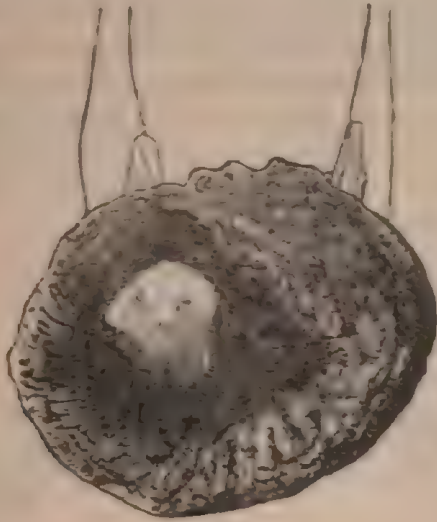


Fig. 40.

age, and affects steers in preference to bulls; the lower jaw is most frequently seized in the vicinity of the second and third molar teeth. (See Fig. 41.)

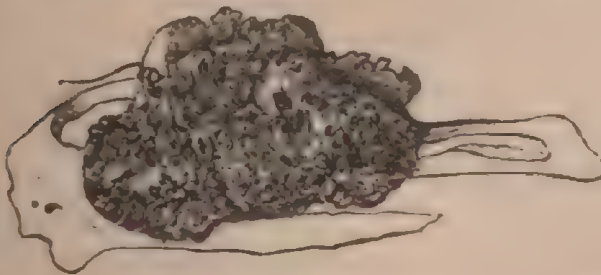


Fig. 41.

" Sometimes the upper jaw is implicated, and from a beautiful specimen I obtained the subjoined illustration.

"Symptoms.—At a spot on the side of the face corresponding to the roots of the third or fourth grinder, above or below, a small, hot, circumscribed swelling occurs. The animal experiences no inconvenience from it, except when the part is struck or pressed upon. The tumour, however, grows and pain increases. In some cases the growth is rapid, and in a few months the disease has invaded the larger part of one-half of the upper or lower jaw, and gives rise to severe symptoms, which arise chiefly from disturbed mastication, pain, and often from various cruel methods of treating the disease. The teeth become loose in their sockets, may be affected by caries, and drop out. Anacker says that sometimes a fistula opens into the mouth.

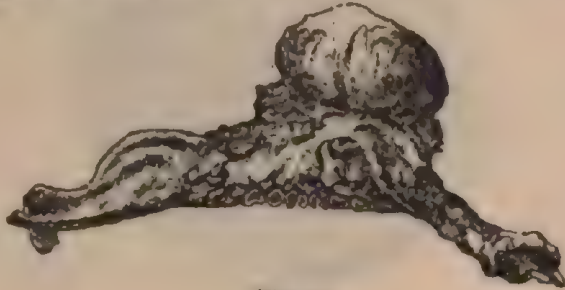


Fig. 42.

"Nature and Causes of the Disease.—It is evidently a morbid condition of the bony structure. On dissecting the skin off the tumour, we find it covered with tough fibrous tissue arranged in layers. The fibrous element diminishes towards the deeper parts of the growth, where at various parts yellow accumulations of a friable, cellular, or granular matter are enclosed in solid cavities, surrounded by bony plates or a tough gristly tissue. M. Collignon, veterinary inspector of the slaughter-house of Montmartre, has observed the disease three times in 300 oxen, and those he found affected came from the marshy plains of La Rochelle.

"In the plains of Ferrara and in the Maremme of Tuscany the disease is very frequent. Low-bred animals are most subject to it, and its origin is usually attributed to a blow.

"Treatment.—In the early stage the small tumour may be blistered, or iodine ointment rubbed over its surface daily for a week. Should this fail to disperse the disease, it progresses in spite of all treatment, and most rapidly if any attempt is made to

extirpate the growth. The proper advice in any such case is to consign the animal as soon as possible to the butcher. As I mention in my work on 'Dairy Stock,' this malady is incurable, and dairy-keepers should not allow cows to be treated for any length of time, as I have seen them occasionally in Yorkshire."

GLOSSITIS.

Glossitis, or inflammation of the tongue, is frequently met with in the ox, but it is rarely seen as an idiopathic malady.

Causes.—Among these may be mentioned derangement of the digestive organs, certain kinds of food, local irritants, intense cold—as pasture covered with hoar-frost—injuries, and wounds.

Symptoms.—Protrusion and enlargement of the organ, with profuse salivation; it is also of a deep red colour, hot and sensitive; there is frequent gasping and threatened choking, with continual attempts to retract the tongue, which, when effected, is usually momentary; considerable effusion takes place along the under surface and sides of the organ; the respiration is difficult, and the constitutional disturbance is often very great.

Terminations.—Resolution, abscess, mortification.

Treatment.—Professor Simonds advises bleeding largely to relieve the inflammatory action, and relieving the vessels of the organ itself by scarifying on every part of the tongue we can reach, but not too deeply, or it may give rise to abscess, and in the next place to keep it from the action of the air and use fomentations constantly. Medicine, he says, should be administered, but not by horn or bottle, as we should, in all probability, choke the animal, so must inject it by means of the stomach-pump, fixing a catheter on and passing it down the nostrils. He recommends saline aperients, and diuretics, as nitrate of potash, in the water. The application of irritant agents to the inflamed mucous membrane should be avoided.

Astringent gargles are also useful. In threatened asphyxia tracheotomy should be performed.

GLOSSANTHRAX.

When anthrax fever localizes itself in the tongue it is termed glossanthrax. Professor Simonds describes it as malignant blain

or carbuncle of the tongue. Formerly it was of common occurrence in this country, and was known in certain counties by a special name—to wit, in Devonshire, "ting," from the tingling sensation and the desire of the animal to rub itself.

The disease appears suddenly, and very frequently during the prevalence of the foot-and-mouth complaint. Fleming observes: "The localized varieties of anthrax in bovine animals are numerous. One of the most remarkable, perhaps, is one which, though very common in this country and on the Continent in former times, is now becoming somewhat rare as an epizootic, and even as an enzootic disease. This is 'glossanthrax,' which has some striking points of difference from the other varieties, and is characterized by an eruption of vesicles or 'phlyctenæ' on the dorsum, and at the base, sides, and about the frænum, of the tongue; as well as on the gums, palate, inner aspect of the lips, and even on the cheeks, their appearance being seldom accompanied by fever. The vesicles are at first white and translucent, but they soon change to a grey, yellow, violet, and finally a blackish disagreeable colour; and they may either be situated directly on the mucous membrane or on the summit of a small submucous tumour.

"They increase rapidly in size, especially when few in number, and may become as large as a hen's egg. The tongue swells and becomes pendent, or protrudes only beyond the incisors, which compress and mark it; at the same time it assumes a bluish or black hue. The vesicles rupture, and discharge an acrid corrosive fluid, leaving ragged ulcers, red in the centre and black around their margin; or they are covered by an eschar, beneath which ulceration goes on rapidly, to the destruction of the texture of the tongue, lips, gums, cheeks, and other parts involved. When the vesicles rupture, the phenomena of anthrax fever appear; the parts adjoining the ulcers are greatly tumefied; the animal manifests indications of intense pain; a thick stringy mucus, mixed with blood and ichorous gangrenous masses of the most acrid description, flows in abundance from the mouth; the tumefaction attacks the lips and cheeks more severely, and reaches the base of the tongue, pharynx, larynx, and soft palate, and the creature may die of asphyxia, if not of the disease itself, in a few hours—usually from twenty-four to forty-eight—after the appearance of the vesicles.

"In those cases in which a judicious curative treatment has been

adopted, and the progress of the disease is checked, the ulcers in the mouth may persist for a somewhat considerable period, and much hinder the prehension and mastication of the food.*

* As the local alterations precede the fever, glossanthrax does not appear to be due to primary miasmatic infection, but to transmission by contact or inoculation.

Treatment.—Glossanthrax is cured by timeously incising (by means of scissors) and destroying the vesicles in the mouth. So that when the disease is prevalent, it is a wise precaution to inspect this aperture frequently in healthy animals; and as soon as a vesicle is perceived, the tongue should be carefully seized, the part incised and thoroughly cauterized with sulphuric, hydrochloric, or nitric acid, or a solution of sulphate of copper; the actual cautery may also be used with the same object, and the mouth afterwards washed with a strong solution of salt. Should there be gangrenous ulcers beneath the eschar, the latter ought to be removed and the sore treated like the vesicle. It may be necessary to scarify the tongue, should it be much swollen. In all cases care must be taken that the discharge does not escape towards the back part of the throat, or be swallowed by the animal; and those who perform this operation, and dress the mouth, should be careful not to soil their hands, face, or any other part of their body with this matter, nor inhale the breath of the diseased animal.

"The internal treatment is the same for the other forms." (See "*Anthrax*.")

* Outbreaks of glossanthrax in the equine species are frequently recorded in the annals of veterinary pathology. A notable one occurred in England in A.D. 1252, and another in Silesia in 1718. See "*Animal Plagues*," pp. 76, 230.

It has also appeared in the cervine tribe, "tongue evil" being by no means rare among deer on the North American continent.

Two most extraordinary epizootics of glossanthrax occurred in 1682 and 1731. The first appears to have spread from west to east, through Switzerland, France, Germany, Poland, and Holland, and travelled, it was reported, at an uniform rate—nearly two German miles in twenty-four hours. Cattle only seem to have been attacked. In the outbreak of 1731, however, all the domesticated herbivores were involved, and the transmissions to other species were remarkably frequent and fatal. It spread in France, Switzerland, Germany, and Italy, commencing its extension early in 1731, and terminating its career in Ferrara and the Romagna, where horses, cattle, sheep, and pigs suffered most severely in 1732.

INDURATION OF THE TONGUE.

Induration or hardness of the tongue is of serious importance. Professor Simonds observes: "In the first instance it may be only partial. The tongue also may be affected with cancer or scirrhus, so care must be taken not to be mistaken. A little time, however, generally suffices to tell which it is. If only indurated, the part hardened would become smaller; on the contrary, in cancer it increases in size. Another point to be observed is the alteration which takes place during its progress. In cancer it becomes softened, also the salivary and sublingual glands, which subsequently burst and a purulent discharge takes place. Nothing of this kind takes place in induration of the tongue.'

Treatment.—This, he remarks, 'is at all times uncertain; but still, if the animal can take a little food, measures may be tried, both local and constitutional. The local should consist in the application of some stimulating agent to the hardened part, as friction with iodine or turpentine, by means of a stick wrapped with cloth dipped in the mixture, and rubbed on the sides and tip of the tongue.

"With regard to constitutional remedies, we may use chloride of mercury or iodine, or both combined, and impregnate the system therewith; but we must recollect we cannot impregnate the system of the ox with mercury without injuring the animal.

"Some practitioners administer it with chalk, and certainly it is a good idea, but it is chiefly used in small animals. Iodine should be given the same way. The food also should be cooked or scalded."

In the *Veterinarian* for September and November, 1877, some interesting observations are made concerning indurated or scirrhus tongue, which would appear to be prevalent in Lincolnshire, both in the high country and throughout the fens. Captain Russell says: 'I have observed that the disease commences with small patches of a yellow colour associated with thickening of the mucous membrane, sometimes on the dorsal surface, sometimes on the tip, and at others underneath the tongue, or on one or other of its sides. This thickening in the course of a short time breaks up into a number of small pimple-like excrescences, which soon become confluent. As the disease spreads a cheesy deposit is

thrown off, leaving a very red and angry-looking surface. Subsequently the organ becomes hard and swollen, and eventually hangs from the mouth perfectly useless. The animal quickly loses the power of prehension and deglutition, and if not destroyed usually succumbs to inanition." In reply to questions submitted to Captain Russell, he replies:

"1. I can trace no connection between this disease and contagious eczema.

"2. I have known many animals which have not suffered from the last-named disease affected with the malady in question.

"3. It is not confined to any particular locality; I have cases in the town of Grantham, and others in high and low situations alike.

"4. I have not been able to trace its cause to any particular system of farming. In my experience it is as frequently seen on highly cultivated farms as in those low in fertility and locality.

"5. It prevails in both males and females.

"6. In the course of the disease I have not observed any indications of visceral derangement.

"7. Among the causes which have suggested themselves to my mind are: feeding on barley straw and chaff, especially straw grown with patent manures; but I must say that I have seen some of the worst cases in animals at grass, and also when fed on grains and roots.

"8. I am not in possession of any facts tending to prove it to be hereditary.

"9. I have seen it in six-months-old calves, in two-year-old bullocks and heifers, and in old cows.

"10. I consider it to prevail to the largest extent in animals about two years old.

"11. I do not regard it as contagious or infectious. This year I have known three diseased beasts to cohabit with twenty or thirty others in a straw-yard without transmitting the affection to any of them.

"12. As a rule I have found but one animal affected in a herd; the case above cited is the only exception I have met with."

Various methods of treatment have been adopted, but with little success. Mr. Goforth Wyer, of Donington, prescribed half-drachm

doses of calomel occasionally, and iodide of potassium daily ; and where the tongue was denuded of its membrane, he applied a solution of nitrate of silver occasionally, or a weak nitric acid solution. Two cases out of four recovered.

PARALYSIS OF THE TONGUE.

Paralysis of the tongue is occasionally met with in the ox.

Causes.—Injury ; debility.

Symptoms.—The organ usually hangs drooping from one side of the mouth. There is inability to gather in the food. If placed in the mouth it speedily protrudes again, and from exposure becomes dry and somewhat shrunk in appearance.

Treatment.—This, as in all cases of paralysis, consists in the administration of remedies and the application of agents externally, which are calculated to restore nerve force. Among the former stands pre-eminent *nux vomica*—from 2 to 3 drachms may be given twice or thrice a day in a pint of old ale. A combination of sulphate of iron, 4 drachms, is also useful. Counter-irritation, or the insertion of a seton in the submaxillary space, is likewise highly beneficial.

The paralyzed organ should also be frequently placed in the mouth and kept there for a time.

The diet is best composed of slops, and these should be placed within reach of the animal, that they may be partaken of whenever inclination prompts him. If not taken voluntarily, forcible administration is necessary.

PHARYNGITIS.

Inflammation of the pharynx rarely occurs as an independent affection in the ox ; it chiefly arises from extended inflammation of the adjacent parts, and particularly in the disease known as " malignant sore throat."

Symptoms.—There is soreness on manipulation and difficulty in swallowing ; the head is poked out, and not unfrequently a frothy discharge issues from the nostrils ; an irritable cough is sometimes present, and there is more or less constitutional disturbance. In acute cases pharyngeal abscess may form at the

posterior part of the pharynx and break into the mouth, or backward into the submucous tissue, and give rise to swelling in front of the neck.

Treatment.—The local treatment should be entirely soothing, the inhalation of steam from scalded bran and poppy heads is therefore extremely beneficial. In urgent cases the external application of mustard, or hot fomentations, should be had recourse to. Acidulated drinks may also be given, but great care must be exercised in drenching the animal, owing to the difficulty of deglutition and the irritability of the parts. Nourishment should be afforded in the form of bland mucilaginous matters, as well-boiled gruel or linseed-tea.

In the event of the disease assuming a chronic form, the application of strong iodine liniment externally, and of the iodide of potassium internally, with nitrated water, forms the most suitable treatment.

PHARYNGEAL ABSCESS.

As already observed, acute pharyngitis may terminate in abscess. In the *Veterinary Journal* for August, 1880, an interesting article on this subject appears from the pen of Mr. C. Whitworth, F.R.C.V.S., London, headed 'Retro-Pharyngeal Abscess in Cattle.'

"In certain animals there is a predisposition to take on disease, but here the exciting cause appears to be exposure to cold, etc., or may be connected with a strumous diathesis, which, however, now and again affects one or more cattle in a herd—from the fact that the patients have been exposed to the same unwholesome influences which operate upon similar constitutions—'shorthorns, to wit.'

"The abscess is the result of acute or chronic inflammation locally manifested in the tissues about the pharynx, and which is insidious and perilous; impeding deglutition and obstructing respiration. The painful deglutition increases until it is found that solids are refused and liquids regurgitated through the nose. Frequent spasmodic attempts are made to swallow, as if there was something in the mouth, sometimes with and sometimes without an augmentation of their natural secretion; unable or unwilling to

swallow the abundant saliva, the patient allows it to dribble from its mouth. Although the act of swallowing is difficult and painful, we perceive on looking into the fauces no appearance which can account for these symptoms, yet, in the greater proportion of cases which have occurred, the morbid action has proved fatal.

Symptoms.—Roaring (audible at a distance); dysphagia; occasional rigors (indicative of suppuration); dyspnoea; marasmus; rumination suspended.

"In 1872, at the request of Lord Brownlow, of Belton Park, Lincolnshire, I examined one of his most valuable short-horned bulls, which I certified to be suffering from a "retro-pharyngeal abscess," and that, in my opinion, death would terminate in apnoea, unless tracheotomy was had recourse to, and that the crisis would be when he rejected his solid food.

"However, ere their deliberations were matured, the bull died of apnoea. I was present at the autopsy, which revealed the correctness of diagnosis. The abscess was large, contained more than a quart of pus; the walls were thick; other viscera healthy.

"About a month later, on the same 'farm,' another shorthorn, (a heifer in calf) showed similar symptoms, which animal I was requested to visit and report upon, when I proposed the following operation: to insert a tracheotomy tube, and then cut down into the parotideal region, puncture the wall of abscess, making a dependent orifice in the submaxillary space, and thereby discharge the contents of abscess; then pass a seton from above to below, and treat as a common wound. The above operation was approved of, consequently I operated on heifer (instantly). Afterwards had her removed into a covered yard; gave her salines; allowed her nutritive and sloppy diet; the wound was dressed with carbolic dressings.

"On the following day I visited her, when I found that she was ruminating, and that she had partaken of all the food that was given to her, and in the main appeared comfortable.

"So far satisfactory; days, weeks, and months rolled on, when she was regarded, save her isolation (and that the tube required removing daily to be washed and reinserted and strapped round the neck, which the foreman soon learned to accomplish), as one of the herd. At this time the heifer was on full diet, ruminating and increasing in bulk, when an accident occurred.

"It appears that the heifer was drinking at the trough, and in leaning over its sides, the water being low, she broke the strap which was attached to and secured the tracheotomy tube; the granulations, being exuberant at the orifice in the trachea, collapsed, ejecting the tube and plugging the orifice; when her respirations became accelerated, and the men at the farm alarmed and unable to find the tube (which had dropped into the trough), they sent for me, but unfortunately I was away from home, when they resolved to cut her throat lest she might die ere I arrived.

"In the same month of the same year, I was called in to examine two of the cattle the property of the Rev. Potchett, M.A., of Denton, Lincolnshire, which were suffering from the same condition. These animals were so emaciated that I considered it economy to slaughter and send them to the kennels, rather than to treat, which recommendation was accepted."

PHARYNGEAL POLYPI.

Polypus in the pharynx of the ox is a very usual occurrence. Gamgee observes: "One of the most common conditions in cattle is the production of pendulous tumours or pharyngeal polypi, which hang from the posterior part of the nose, and sometimes suddenly drop on the larynx and choke the animal.

"The symptoms which these growths produce in the passage between the mouth, nose, gullet, and windpipe, are chiefly efforts to swallow, and obstruction to breathing, with an occasional cough, relieved by the animal hanging down its head so as to press the tumour forwards.

"These growths, which are formed from the mucous membrane, with areolar tissue as their principal constituent, may be removed by torsion, if discovered."

SALIVATION.

Salivation is not an unfrequent disease in the ox. When unassociated with any local affection of the mouth or neighbouring structures, it is usually an indication of mercurialism,

though certain conditions of provender have been known to give rise to it.

Symptoms.—When due to mercurialism, the secretion of saliva is very great; the teeth are loose and discoloured, the gum, particularly around the incisors, is spongy, swollen, and tender, and of a deep red, often approaching a purple hue. A similar condition is also frequently observed in the pad or cushion against which the lower incisors (the only ones in the ox) meet, hence the pain in partaking of food, which the animal is always reluctant to do. The breath is singularly fœtid; the tongue furred, and red down the sides. There is usually excessive thirst. In severe cases the face becomes swollen, and the joints hot and tender.

Treatment.—The most effectual antidotes for poisoning by mercury are albuminous compounds, the white of eggs being perhaps the best, especially in the case of corrosive sublimate.

Christison, writing on the subject, observes: "It has already been hinted that albumen, in the form of white of eggs beat up with water, impairs or destroys the corrosive properties of bichloride of mercury, by decomposing it, and producing an insoluble mercurial compound. For this discovery, and the establishment of albumen as an antidote, medicine is indebted to Professor Orfila. He has related many satisfactory experiments in proof of its virtues.

"According to Peschier, the white of one egg is required to render four grains of the poison innocuous.* The experiments of the Parisian toxicologist have been repeated and confirmed by others, and particularly by Schloepfer.

"Dr. Samuel Wright has found that if the administration of albumen is followed up by giving some astringent decoction or infusion, the beneficial effects are more complete, because the compound formed is less soluble in an excess of albumen. Albumen is chiefly useful in the early stage of poisoning with corrosive sublimate, and is particularly called for when vomiting does not take place. But it further appears to be an excellent demulcent in the advanced stages.

"Five or six parts of fresh gluten, in fifty parts of a solution of soft soap, has been found also a successful antidote, and where neither albumen nor gluten is at hand, milk is a convenient and useful substitute. Iron filings, the protosulphuret of iron, meconic

* Corvisart's *Journal de Médecine*, xxxviii. 77.

acid, and charcoal, have each been advocated as mercurial antidotes.

"The treatment of mercurial salivation consists in exposure to a cool pure air, nourishing diet, and purgatives, if the intestinal canal is not already irritated. In some of the inflammatory affections it induces, venesection is required, in others it is hurtful. In some complaints induced by mercury, as in iritis, the poison appears to be its own antidote, for nothing checks the inflammation so soon and so certainly as mercurial salivation.

"Dr. Finlay, of the United States, proposed to check mercurial salivation by small doses of tartar emetic frequently repeated, so as to act on the skin,* and Mr. Daniel has recommended large doses of the acetate of lead as an effectual antidote for the same purpose.†

"Dr. Klose, a German physician, says he has found iodine to possess the property of arresting the effects of mercury on the mouth.‡ The iodide of potassium is generally acknowledged to be one of the best remedies for eradicating the constitutional infirmities left in many by severe courses of mercury."

Gamgee§ observes: "The secretion of saliva may be diminished, increased, or perverted. Its diminution is observed in febrile diseases, and also in affections associated with a free discharge of water from the blood. Its density then increases, and the mouth of the animal becomes hot and clammy. The saliva may be diminished in quantity from disease of the glands, or closure of the ducts.

"*Ptyalism*, or excessive secretion of saliva, is not so common in the lower animals as in man, in whom it has been frequently witnessed, as the result of the administration of mercury. Mercurial ptyalism is, however, seen, and especially in cattle, from rubbing mercurial ointment on the skin for mange. Severe salivation in the horse has been observed from this animal having been forced to eat green food highly charged with mustard, and this is a common cause of ptyalism also in the ox.

"Mathieu saw peculiar attacks of salivation in the autumn of 1852, from horses, cattle, and sheep eating clover and esparcet,

° *Edin. Med. and Surg. Journal*, xxix. 218.

† *Lond. Med. Repos.*, N. S., vi. 368.

‡ *Lond. Med. Gazette*, 1836-7, ii. 144.

§ "Our Domestic Animals in Health and Disease."

which had become of a brown colour, and this was believed to be due to a change in the chlorophyll in the leaves. Two pounds of such hay caused horses to lose from thirty to thirty-six pounds of saliva in from five to six hours, giving rise to great thirst.

"When any source of irritation exists in the mouth, the discharge of saliva is often very great.

"*Treatment* in all such cases consists in removing the cause, and using locally cold water injections into the mouth, coupled with frictions around the salivary glands, with slightly stimulating embrocations.

"The saliva undergoes serious changes in disease. It becomes poisonous in rabies, and preserves its poisoning properties about twenty-four hours after the death of the animal; but Count Salm has experimented on the dried foam from the mouth, and has been successful in communicating the disease.*

"The saliva becomes charged with the virus of epizootic aphtha, with the poison of glossanthrax, and is perverted also in the contagious typhoid or *steppe* disease."

STOMATITIS.

Concerning this malady and its divisions, English veterinary literature is extremely scant; some writers omitting even to mention it, some giving it merely a cursory glance, whilst others have confounded it with exudative stomatitis, commonly known as "thrush," and divided it into aphtha simplex, aphtha anginosa, and aphtha maligna.

Stomatitis, or inflammation of the mouth, is a disease usually confined to young calves. It assumes three forms, viz.:

1. Follicular stomatitis, simple inflammation of the mucous follicles of the mouth, usually arising idiopathically from debility, from a disordered and heated stomach, or from eruptive disease.

Symptoms.—Difficulty in sucking or swallowing. Profuse secretion of saliva. Tenderness and swelling in the region of the submaxillary glands. Restlessness, offensive diarrhoea. Within the mouth, on the tongue and fauces, small greyish-white vesicles, which burst and leave sluggish ulcers. The ulcers may coalesce or die away and be succeeded by fresh ones.

* See the "Veterinarian's Vade-mecum," p. 216.



POSTERIOR PART OF THE MOUTH OF A CALF AFFECTED WITH
GANGRENOUS STOMATITIS.— LOWER JAW DIVIDED AT THE SYMPHYSIS
TO SHOW PALATE AND TONGUE DRAWN BACKWARDS TO EXPOSE FAUCES.

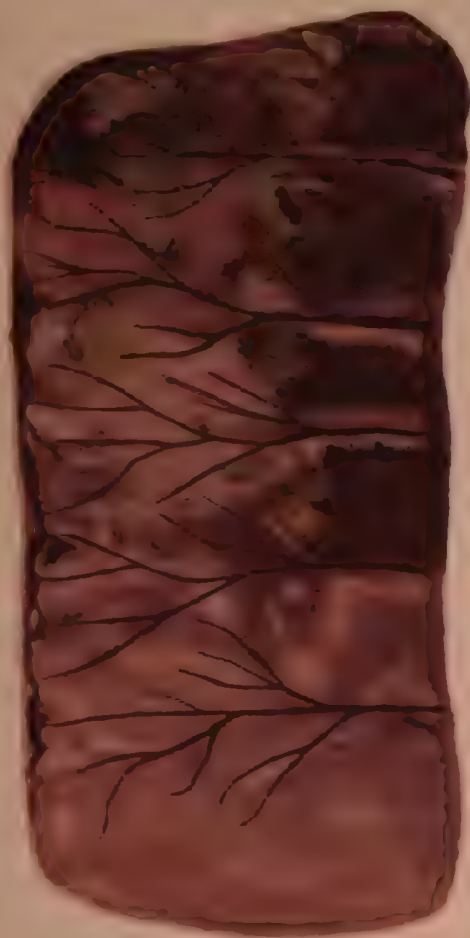
A
ORIGINAL

Plate 10.



PORTION OF RUMEN OF A CALF AFFECTED WITH
GANGRENOUS STOMATITIS.

^B
ORIGINAL.



PORTION OF COLON OF A CALF AFFECTED WITH
GANGRENOUS STOMATITIS.

C
ORIGINAL

Plate 12.



PORTION OF LUNG OF A CALF AFFECTED WITH
GANGRENOUS STOMATITIS.

D
ORIGINAL.

Treatment.—The application of borax and glycerine, 2 drachms of the former to 1 ounce of the latter; small doses of alkalis and antacids, carbonates of soda and magnesia; chlorate of potash; mild tonics. Nourishment other than the parent's milk. Attention to the condition of the latter.

2. Ulcerative stomatitis, or noma—ulceration and destruction of the gums, exposure and loosening of teeth—arises from defective nourishment and debility, bad hygiene, eruptive diseases, and contagion.

Symptoms.—Swollen, turgid, and spongy condition of the gums, followed by ulceration, with their destruction and exposure and loosening of teeth. Heat of mouth. Tenderness and swelling in submaxillary region. Profuse salivation. Fœtid breath. Patches of sloughing on the inside of the cheeks.

Treatment.—Borax and glycerine; weak astringent and mucilaginous solutions; carbolic or salicylic acid. Medicinally, alkalis, antacids, tonics, mucilaginous and nutritious food. Pure milk and isinglass. Maternal attention.

3. Gangrenous stomatitis—*cancerum oris*, tubercular stomatitis—occurs in more matured calves. Arises from tuberculous diathesis; debilitating diseases; contagion.

Symptoms.—Fœtid breath, offensive saliva; painful swelling on one cheek, of a white aspect on the inside of the mouth; it contains cheesy matter, which gradually softens, destroys all the surrounding structures, and spreads to the gums, lips, and tongue, and in some cases to the pharynx and larynx, assuming a diphtheritic type, with which I am of opinion the disease is associated. See Fig. A, Plate 9. Pulmonary complications are frequently present, and very often the disease may be traced in the stomach and intestines. See Figs. B, C, D, Plates 10, 11, 12.

Treatment.—Excision of the disease. Application of nitrate of silver or nitric acid. Warm astringent and antiseptic syringing. Medicinally, tonics, chlorate of potash, sulphite of soda, and good nursing.

An excellent article on this latter form of stomatitis appears in the *Veterinary Journal*, January, 1881, from the pen of A. E. Macgillivray, M.R.C.V.S., Banff, N.B., in which he recommends excision of every vestige of the disease, dressing with pulv. cupri sulph., and the administration of sulphite of soda.

THRUSH.

Thrush, aphtha, stomatitis exudativa, or muguet, is more a symptomatic than an idiopathic disease, occurring in young animals from disorder of the digestive organs, or impaired nutrition, and has been more frequently observed by some authorities in animals artificially reared, or which have been suckled by an unhealthy parent.

In old animals it has arisen from prostrating diseases, or from defective digestion, through weakness of the organ. "Two microscopical parasitic plants—*Leptothrix buccalis*, and *Oidium albicans*—developed in large quantity, in and between epithelial cells of mucous membrane; filaments and spores of these fungi render epithelium friable, loose and swollen."—*Tanner*.

Symptoms.—Numerous white curd-like specks covering the mucous membrane of the mouth, most abundant on the inner surface of the cheeks, tongue and fauces, and occasionally from acrid evacuations, on the edge of the anus and vagina. Loss of appetite, salivary discharge, difficulty in swallowing, debility, and diarrhoea.

Treatment.—Borax and glycerine, carbolic or salicylic acid, weak astringents. Medicinally, chlorate of potash, carbonate of soda, mild tonics, nutritious food, good hygiene, change of milk.

DISEASE OF THE MOUTH FROM MECHANICAL INJURY.

The mouth may become diseased from the intrusion of foreign substances, especially the imbedding of such in the cheeks, which give rise to considerable irritation, the formation of abscess and its complications. In the *Veterinarian* for March, 1871, the following interesting case is recorded by Mr. Olver, of Tamworth :

'On Monday, the 9th of January, I was requested by Mr. Hatchett, of this place, to see a two-year old heifer, which I did on the following morning, and found that she had an enlargement on the side of the face, which I was informed had existed since

others which, though regularly enough narrower. At first there is remarked a width of the chief ones, between which it of its sides, another, one-half narrower; these, two denticulated laminæ, more or less way, the laminæ which are inserted are the longest and widest; and those as viscus become shorter and narrower as curvature. The space comprised between always filled by the very attenuated are usually impregnated by a very are also often dry, and sometimes even

layer is a dependency of the periphery; particular; it does not completely

much fasciculated and thin.

is remarkable for the thickness of its; all the leaves are formed by two and one against the others; and as their will notice it.

composed of this duplicature of mucous of muscular fibres between; these at the commencement of the leaf, the vessel; in the remainder of their by the vessels that pass towards the are detached from the surface of certain points, from its deep layer. In there to be only one layer of muscular various-sized papillæ, the smallest of flat, and have for base a mass of connective superficial fibres form a kind of shaped. They receive bloodvessels, connective tissue elements with a somewhat with nuclei, which we considered

(c)—*Situation—Form—Relations.*
to the rumen for capacity. It is a self, elongated from before to behind,

CHAPTER VI.

DISEASES OF THE STOMACH.

*Anatomy and Functions of the Ruminant's Stomach.—Indigestion.—Vomition.
Hoven.—Grain-sick.—Inflammation of the Rumen.—Inflammation of the
Reticulum.—Inflammation of the Omasum.—Gastritis.—Hair-Balls.—
Foreign Bodies.*

BEFORE entering on the subject of the Diseases of the Stomach, I think it may be useful to the general reader to present a few remarks on the anatomy and functions of the ruminant's stomach, differing so widely as it does from that of the other domestic animals. These observations I extract (abbreviated) from Chaveau's work, the most trustworthy comparative anatomist we possess :

THE STOMACH OF RUMINANTS.

"These animals are distinguished from the others by the faculty they possess of swallowing their food after imperfect comminution, and causing it to return again into the mouth to submit it to a second mastication, previous to final deglutition. The gastric apparatus is admirably arranged to effect this physiological finality, and is remarkable for its enormous development, as well as its division into four separate pouches, which are regarded as so many stomachs.

"These cavities represent a considerable mass that fills the greater part of the abdominal cavity, and the medium capacity of which is not less than fifty-five gallons! One of them, the *rumen*, into which the *œsophagus* is inserted, constitutes nine-tenths of the total mass. The other three, the *reticulum*, *omasum*, and *abomasum*, form a short chain, continuous with the left and anterior portion of the rumen. The abomasum alone should be

considered as a true stomach, analogous to that of the dog, or the right sac of the ventriculum of solipeds. The other three compartments only represent, like the left sac in the latter animals, oesophageal dilatations.

Rumen (Fig. 43).—This reservoir, vulgarly designated the *paunch*, alone occupies three-fourths of the abdominal cavity, in which it affects a direction inclined from above to below, and from right to left.



Fig. 43.—Stomach of the Ox, seen on its right upper face, the abomasum being depressed : 1, rumen, left hemisphere ; 2, rumen, right hemisphere ; 3, termination of the oesophagus ; 4, reticulum ; 5, omasum ; 6, abomasum.

" *External Conformation.*—Elongated from before to behind, and depressed from above to below, it offers for study : 1. An *inferior* and a *superior* face, nearly plane, smooth, and divided into two lateral regions by traces of fissures, which are only sensible at the extremities of the organ ; 2. A *left* and *right* border, smooth, thick, and rounded ; 3. A *posterior extremity*, divided by a deep notch into two lobes, described by Chabert by the name of *conical cysts* ; 4. An *anterior extremity*, offering an analogous arrangement, and concealed, at first sight, by the stomachs

(or compartments) superadded to the rumen; the notch on the right of this extremity divides it into two unequal pouches, which will be referred to presently.

" These two notches divide the rumen into *two sacs*, a *right* and *left*. The *right sac*, the shortest, is in great part enveloped by the serous covering which constitutes the great omentum; the *left sac* surpasses the other by its two extremities, except in the sheep and goat, in which the right conical cyst is longer than the left. The anterior extremity of this left sac is thrown backwards on the corresponding lobe of the right sac; above, it receives the insertion of the œsophagus, and is continuous, in front, with the reticulum.

" *Relations*.—The external form of the rumen being determined, the study of its relations becomes easy. By its superior surface, it is in contact with the intestinal mass; its opposite face rests on the inferior abdominal wall. Its left border, supporting the spleen, touches the most elevated part of the flank and the sublumbar region, to which it adheres by cellular tissue, as well as the vicinity of the celiac trunk and the great mesenteric artery; the right border, margined by the abomasum, responds to the most declivitous portion of the right hypochondriac and flank, as well as to the intestinal circuvolutions. The anterior extremity, bounded by the reticulum and omasum, advances close to the diaphragm; the posterior occupies the entrance to the pelvic cavity, where it is more or less in contact with the genito-urinary organs lodged there. In the pregnant female, the uterus is prolonged forwards on the upper face of the viscus just described.

" *Interior* (Fig. 44).—In the interior of the rumen are found incomplete septa, which repeat the division into two sacs already so marked externally. These septa are two in number, and represent large muscular pillars, which correspond inferiorly to the notches described at the extremities of the organ. The *anterior pillar* (Fig. 39, 7) sends to the inferior wall of the rumen a strong prolongation, directed backwards, and to the left; it is continued on the superior wall by two branches, which separate at an acute angle. The *posterior pillar* (Fig. 40, 8), more voluminous than the preceding, has three branches at each of its extremities—a middle and two lateral. The middle branches are carried forwards on the limit of the two sacs, which they separate from one another; that from above meets the corresponding branch from the anterior

pillar. The lateral branches diverge to the right and left in describing a curve, and in circumscribing the entrance to the conical cysts, which they transform into two compartments distinct from the middle portion of the sacs of the rumen; the inferior go to meet the superior branches, but do not altogether join them.

"The internal surface of the rumen is covered by a multitude of papillary prolongations, dependencies of the mucous membrane.



Fig. 44.--Interior of the stomach of ruminants; the upper plane of the rumen and reticulum, with the oesophageal furrow: 1, left sac of rumen; 2, anterior extremity of that sac turned back on the right sac; 3, its posterior extremity, or left conical cyst; 7, section of the anterior pillar of the rumen; 7.7, its two superior branches; 8, posterior pillar of the same; 8.8.8, its three inferior branches; 9, cells of the reticulum; 10, oesophageal furrow; 11, oesophagus; 12, abomasum.

To the right, and in the *cul-de-sac*, these papillæ are remarkable for their number, their enormous development, and their general foliated shape. On the left side they are more rare, particularly on the superior wall, and only form very small mammiform tubercles; they are absent on the muscular columns. This papillary arrangement is still more developed in certain wild ruminants, and

it is scarcely possible to give an idea of their richness in the stomach of the gazelle.

"The interior of the rumen offers for study two openings, situated at the anterior extremity of the left sac, one is the oesophageal orifice, pierced in the superior wall, dilated into an infundibulum, and prolonged into the small curvature of the reticulum by a particular furrow (or channel), which will be described after the latter compartment; the other, placed below and opposite the preceding, traverses the bottom of the *cul-de-sac* from before to behind, and forms the communication between the paunch and reticulum; it is a very large opening, circumscribed below and on the sides by a septum or semilunar valve, resulting from the junction of the parietes of the rumen with those of the reticulum.

"*Structure*.—Like all the hollow organs in the abdomen, the rumen has three tunics—a *serous*, a *muscular*, and a *mucous*.

"The serous envelopes the organ throughout, except above, in front, and to the left, the point which touches the sublumbar region, and the pillars of the diaphragm as well as the bottom of the notches which separate the *cul-de-sac* from the extremities. This membrane gives origin, like that of the stomach of the horse, to a vast duplicature—the great omentum. The arrangement of this, which is somewhat difficult to observe in the ox, in consequence of the enormous weight of the gastric mass, is readily seen in the smaller ruminants. It begins at the middle of the faces of the paunch and the fissure intermediate to the two conical cysts, forming a wide envelope that contains the right sac and the abomasum; it becomes attached in passing over the great curvature of the last-named cavity, and is confounded, superiorly and posteriorly, with the great mesentery.

"The muscular coat is very thick, and forms the internal column of the viscus. Its fibres are disposed in several layers, whose arrangement is simple, and offers nothing really interesting to study, except in the points where the serous tunic passes from one *cul-de-sac* to another, or from the rumen to the reticulum; there it is often accompanied by thin and wide muscular fasciculi, which, like the latter membrane, stretch over the intermediate fissures, and thus become real unitive or common fibres.

"The muscular fibres of the rumen present an unmistakable transverse striation—a very rare physical characteristic in the muscular tissue of organic life.

"The *mucous membrane* offers some peculiarities, which deserve a few words. The *corium* is very thick, and probably contains some glands, but they must be extremely few. The free face of the membrane is excessively uneven, in consequence of the papillary apparatus mentioned above.

"The papillæ of the rumen are foliaceous, conical, or fungiform. Those of the first description are much more numerous than the others; they have the shape of an oval, elongated leaf, their summit is wide and rounded, and the base narrow and apparently implanted in the corium. On one face is a little rib that springs from the base and disappears on the widened portion, resembling the principal vein or nervule of a leaf. On the other face, opposite the vein, is a faint longitudinal groove.

"These papillæ are constituted by a layer of nucleated connective tissue, covered by epithelium; the former, in the principal papillæ, has on its faces and extremities minute prolongations, resembling on a small scale the secondary papillæ described as existing on the lingual mucous membrane. In the centre of the papillæ are one or two main arteries, derived from the network of the corium.

"These pass, in a strictly flexuous manner, to the summit, and break up into several branchlets, succeeded by veins, that descend along the surface of the papillæ into each of its secondary prolongations.

"The conical and fungiform papillæ are few in the left sac, and resemble the papillæ of the same name described on the tongue.

"The epithelium of the mucous membrane of the rumen is remarkable for its strength and cohesiveness. It belongs to the category of stratified tessellated epithelium, and forms a sheath to each papillæ, covering the corium in the interpapillary spaces.

"There are frequently found, in opening the rumen of animals just killed, large exfoliated patches on the surface of this layer. This is a sufficient indication of the activity of the secretion of the epithelium, and the rapidity of its renovation.

"*Reticulum (Honeycomb)—Situation—Form—Relations.*—This, the smallest compartment, is elongated from one side to the other, slightly curved on itself, and placed transversely between the posterior face of the diaphragm in one direction, and the anterior extremity of the left sac of the rumen in the other; the

latter only appearing, externally, to be a prolongation or a diverticulum of the rumen."

"It has *two faces, two curvatures, and two extremities*. The anterior face adheres to the phrenic centre of the diaphragm by cellular tissue. The *posterior face* lies against the anterior extremity of the rumen. The *great inferior or convex curvature* occupies the suprasternal region. The *lesser, superior, or concave curvature* partly responds to the lesser curvature of the omasum. The left extremity is only separated from the rumen by a fissure, which lodges the inferior artery of the reticulum. The right extremity forms a globular *cul-de-sac*, in relation with the base of the abomasum.

"*Interior.*—The internal surface of the reticulum is divided by ridges of the mucous membrane into polyhedral cells, which, in their regular arrangement, look like a honeycomb. They are widest and deepest in the *cul-de-sac*, and become gradually smaller in approaching the superior curvature. The interior of these cells is divided into smaller spaces, included one within the other, by secondary and successively decreasing septa. The principal septa offer on their free border a series of conical prolongations, with a rough hard summit; while their faces are studded with minute, blunt, or pointed papillæ. The secondary septa also show similar prolongations; and those on their free margin are even more developed than on the chief septa.

"Lastly, from the bottom of the cells spring up a crowd of long, conical, and very pointed papillæ, resembling stalagmites in their arrangement.

"It may be noted that the foreign bodies so frequently swallowed by ruminants are usually lodged in the reticulum; therefore it is that at the bottom of the cells are found either small stones, and needles or pins—often fixed in the intermediate septa—or nails, scraps of iron, etc. The interior of the reticulum communicates with the left sac of the rumen by the orifice already described, and with the omasum by a particular opening, placed near the middle of the small curvature, though a little more to the right than the left. This opening, eight or ten times smaller than the preceding, is connected with the infundibulum of the cardia by a remarkable groove (or channel), the *oesophageal*, which will be described separately, as it does not properly belong to the reticulum.

"*Structure.*—The *serous membrane* does not cover all the anterior surface of the organ, as the latter adheres to the posterior face of the diaphragm. The *muscular tunic* is much thinner than that of the paunch, and more fasciculated. The fibres pass in the same direction.

"The *corium* of the *mucous membrane* sends a prolongation into each of the septa of the alveoli, and into each of the conical papillæ on these septa, or to the bottom of these alveoli. The stratified pavement epithelium is very thick, and its horny layer is very developed at the summit of the papillæ.

"*Œsophageal Groove.*—This gutter is so named because it appears to continue the œsophagus to the interior of the stomach. It extends on the lesser curvature of the reticulum from the cardia to the entrance of the omasum; commencing in the rumen, it belongs to the reticulum for the remainder of its extent. Measuring from six to eight inches in length, this demi-canal is directed from above downwards, and from left to right, between two movable lips, which are fixed by their adherent border to the superior wall of the reticulum. These two lips are thickened at their free margins, which look downwards and to the left. At their origin at the œsophageal-infundibulum, they are thin and but slightly elevated; but they become thick and salient on arriving near the orifice they surround, though they neither meet nor become confounded with each other.

"The mucous membrane covering these two lips is much corrugated outwardly and on the free border; but in the interior of the groove it possesses all the characters of the œsophageal mucous membrane in being smooth, white, and ridged longitudinally; near the orifice of the omasum it has some large conical papillæ.

"If this membrane be removed to study the subjacent tissue, the following arrangement is observed: At the bottom of the channel, and in the space comprised between its two lips, are transverse muscular fibres, which belong to the rumen or reticulum. The lips themselves are entirely composed of longitudinal muscular fasciculi, particularly abundant towards the free border; these fasciculi are confounded with the proper fibres of the stomach towards the extremities of the canal, and carried from one lip to the other in forming loops around the orifices which communicate by this canal.

"*Omasum* (*Psalterium*, *Many-Plies*, *Many-Leaves*, or *Many-plus*).—In the ox, this compartment is larger than the reticulum, but in the *sheep* and *goat* it is smaller.

"*Situation—Form—Relation.*—Situated above the *cul-de-sac* of the reticulum and the anterior extremity of the right sac of the rumen, this compartment, when distended, has an oval form, is slightly curved in an opposite direction to the honeycomb division, and depressed from before to behind. It has, therefore, an *anterior face*, applied against the diaphragm, to which it is sometimes attached by connective tissue; a *posterior face*, lying towards the paunch; a *great curvature*, turned upwards, and fixed in the posterior fissure of the liver by an omental frænum, which is continued on the lesser curvature of the abomasum and duodenum; a *left extremity*, exhibiting the *neck*, which corresponds to the orifice of communication between the reticulum and many-plies, a *right extremity*, continuous with the base of the abomasum, from which it is separated by a constriction analogous to that of the anterior extremity, but much less marked.

"*Interior.*—This compartment shows in its interior the two apertures placed at its extremities. The right orifice, opening into the abomasum, is much wider than the left, which communicates with the reticulum. The cavity which these orifices bring into communication with the adjoining compartments, offers one of the most curious arrangements met with in the viscera, it being filled by unequally-developed leaves of mucous membrane, which follow the length of the cavity. These laminae have an adherent border attached either to the greater curvature or to the faces of the organ, and a free concave border turned towards the lesser curvature.

"They commence at the side of the orifice of the reticulum by denticulated ridges, between which are furrows, and which are prolonged from the base of the leaves to the entrance of the abomasum. At the latter aperture they disappear altogether, after rapidly diminishing in height. Their faces are studded by a multitude of very hard mamillary papillae, resembling grains of millet, which are more developed and conical on some of the leaves than on others. All these lamellar prolongations are far from being of the same extent: twelve to fifteen are so wide that their free border nearly reaches the lesser curvature of the viscus, and between

these principal leaves are others which, though regularly enough arranged, are more or less narrower. At first there is remarked a secondary leaf, half the width of the chief ones, between which it is placed; then, on each of its sides, another, one-half narrower; and, lastly, at the base of these, two denticulated laminae, more or less salient. In a general way, the laminae which are inserted into the great curvature are the longest and widest; and those attached to the faces of the viscus become shorter and narrower as they draw near the lesser curvature. The space comprised between these prolongations is always filled by the very attenuated alimentary matters, which are usually impregnated by a very small quantity of fluid, but are also often dry, and sometimes even hardened into flakes.

"*Structure.*—The *serous layer* is a dependency of the peritoneum, and offers nothing particular; it does not completely cover the anterior face.

"The *muscular tunic* is much fasciculated and thin.

"The *mucous membrane* is remarkable for the thickness of its stratified pavement epithelium; all the leaves are formed by two layers of this membrane laid one against the others; and as their structure is interesting, we will notice it.

"The principal leaves are composed of this duplicature of mucous membrane, and two layers of muscular fibres between; these layers are opposite each other at the commencement of the leaf, and separated by a transverse vessel; in the remainder of their extent they are kept apart by the vessels that pass towards the border of the leaf. Their fibres are detached from the surface of the muscular tunic and, at certain points, from its deep layer. In the smaller leaves there appears to be only one layer of muscular fibres; on all the leaves are various-sized papillae, the smallest of which are like a grain of millet, and have for base a mass of condensed connective tissue, whose superficial fibres form a kind of shell; the largest are club-shaped. They receive bloodvessels, and we have found in the connective tissue elements with a somewhat irregular outline, provided with nuclei, which we considered to be nerve-cells.

"*Abomasum (Reel or Rennet)*—*Situation—Form—Relations.*
—The abomasum stands next to the rumen for capacity. It is a pyriform reservoir, curved on itself, elongated from before to behind,

and situated behind the omasum, above the right sac of the rumen. On the right it touches the diaphragm and the hypochondriac; on the left it is related to the rumen. The *greater curvature*, turned downwards, receives the insertion of the great omentum. The *lesser curvature*, inclined upwards, gives attachment to the serous band already noticed when speaking of the great curvature of the omasum. Its *base* is in contact with the *cul-de-sac* of the reticulum, and is separated from the omasum by the constrictions in the form of a thick neck, which corresponds to the communicating orifice of the two stomachs. Its *point*, directed upwards and backwards, is continued by the duodenum.

"*Interior*.—This being the true stomach of ruminants, the mucous membrane lining its interior acquires all the characters which distinguish that of the stomach of the carnivora, or that of the right sac of the horse's stomach. It is soft, spongy, smooth to the touch, vascular, red-coloured, covered by a thin epithelium, and provided with numerous glands for the secretion of the gastric juice. Thinner than in monogastric animals, this tenuity is compensated for by a much greater extent of surface, which is still further increased by numerous lamellar folds. These latter are analogous in constitution to those of the omasum, cross in a very oblique manner the great axis of the abomasum, and altogether affect a kind of spiral arrangement.

"The abomasum has two apertures; one, situated at its base, opens into the omasum; the other, placed opposite to the first, and much narrower, is the pylorus, which is circumscribed, as in the other animals, by a muscular ring.

"*Structure*.—The *serous membrane* is continuous with the omenta which abut on the great and lesser curvatures of the viscus. The *muscular layer* is of the same thickness as in the omasum. The *internal tunic* has already been noticed.

"*Functions of the Stomach in Ruminants*.—We cannot pretend to give here a complete history of the phenomena of rumination, but must confine ourselves to describe in a few words what are the principal attributes of each gastric dilatation.

"The *rumen* is a sac where the aliment taken during feeding-time is kept in reserve, and whence it is again carried into the mouth during rumination, after having been more or less softened.

"The *reticulum* participates in the function of the rumen, to which it is only a kind of diverticulum. But it is particularly with regard to liquids that it plays the part of a reservoir, the solid substances contained in it being always diluted by a large quantity of water.

"The *oesophageal groove* carries into the omasum the substances swallowed a second time after rumination, or even those which the animal ingests in very small quantity for the first time.

"The *omasum* completes the trituration and attenuation of the food, by pressing it between its leaves.

"The *abomasum* acts as a true stomach charged with the secretion of the gastric juice; in this reservoir occur the essential phenomena of gastric digestion."

INDIGESTION.

From the complex structure of the ox's stomach it will be no matter of surprise that he should be the subject at times of indigestion, indeed, more frequently so than is suspected. Many cases have come under my own observation in which the symptoms of a disordered stomach have been mistaken for a graver affection.

Causes.—Bad food, impure water and air, and want of exercise must, as with ourselves, be given the credit of producing in animals indigestion. Among other causes may be enumerated—over-eating, particularly young clover or aftermath (see "Hoven"), rich food stinted diet, long fasts, travelling after eating heartily, morbid appetite, foreign bodies in the stomach, disease, defective teeth (an unusual occurrence in the ox). Sucking calves are frequently affected with indigestion, owing to the objectionable and unnatural custom of limiting their approach to the mother to morning and night, with either a long fast between, or giving food in the interval which their young stomachs cannot assimilate. In these young creatures it is also due sometimes to the presence of hair-balls.*

* "In young calves, indigestion, associated with convulsive fits, is sometimes due to hair-balls; these, after a time, become gradually disintegrated by the movements of the stomach, and the symptoms may slowly disappear."
—*Williams*.

Symptoms.—Vomiting, a prominent symptom in human beings, is rarely observed in cattle, but when an accompaniment it is very marked. Professor Williams states that he has witnessed very forcible vomiting in cattle suffering from indigestion, as well as the passive return of food into the mouth, which occurs during the profound coma of parturient apoplexy. A morbid appetite is also a symptom of indigestion as well as a cause. Animals with dyspepsia relinquish by degrees their natural food, and seek dirt, dung, wood, leather, linen, stones, and in fact almost anything that comes within reach will be partaken of. Thirst is another accompaniment of this condition, and almost any kind of water will be greedily swallowed. The coat has a staring appearance, the skin is tight or hide-bound, tympany is frequently present, and obstinate constipation, varied now and then with a sharp attack of diarrhoea, or the latter may be persistent from the irritation of foreign bodies. The breath also in protracted cases becomes offensive, the temperature low and the pulse feeble; the animal presents a dull dejected appearance, emits low moans and grates the teeth. Unless remedial measures are taken emaciation rapidly ensues, and death from exhaustion or organic disease takes place.

Treatment.—Bearing in mind the numerous causes which operate in producing dyspepsia, our attention must first be directed to finding out its origin to its immediate removal. In simple dyspepsia arising from bad food and water and defective ventilation, steps must be taken to remedy each evil, and it may be necessary to prescribe tonics. A more sparing diet will apply to over-eating, and a less stimulating one to cases where the food has been too rich. Long fasts are to be avoided. A morbid appetite is best responded to by the administration of mineral tonics and tempting food. Foreign bodies in the stomach, if suspected, can only be dealt with by oleaginous aperients and mucilaginous food, or when the animal is fat—slaughter. Defective teeth must be treated surgically. In the case of calves, nature should not be interfered with; i.e., the calf should be suckled when hungry, and small doses of bicarbonate of soda may be advantageously given to counteract acidity. And in weaning, proper and easily assimilated diet should be allowed. Where obstinate constipation exists, saline aperients may be given. Flatulence is best overcome by abdominal friction, and 2 to 3 drachm doses of carbonate of

ammonia every three or four hours, or $\frac{1}{2}$ an ounce of the arom. spts. ammon. in a little chilled water. In cases where extreme debility is attendant, brandy, old ale, or stout with well-boiled gruel, is called for. Cleanliness in all cases should be observed.

VOMITION.

It has already been observed that vomiting in cattle is a rare occurrence. Gamgee states: "Ruminants are only slightly susceptible to the action of emetics, and this is very remarkably shown by the enormous doses of potassic tartrate of antimony which cattle will bear without manifesting the slightest symptom."

The difficulty thus encountered in nauseating them will explain the rarity of vomition. It is usually due to some special cause. I have observed it after metallic substances have been swallowed. It has been described by some authorities as occurring in parturient apoplexy, but this I look upon as eructation with an involuntary passage of ingesta.

Professor Simonds observes: "The pathology of vomition in the ox is exceedingly obscure. I gave a sheep some salt water for the express purpose of seeing how much had to be given to produce vomition, and almost immediately the whole contents of the rumen were ejected and the animal sunk. No matter whether the herd be small or large, only one animal is affected, thus showing there is some special cause. I believe that these cases arise from some foreign agent in the rumen, but more especially the reticulum. I recollect a case in the abomasum where the vomiting was continual, and due to a number of pebbles which had passed from one stomach to the other. In the reticulum in which, as we know there is a number of cells, we often find in the septa pieces of wire nails, etc., which are more likely to be there fixed than in any other part. There is a reason for this: the reticulum is the regulator of the amount of food to pass into the next stomach, which it does not let enter until soft and in a proper state; and when a portion of wire or nail is presented at the opening into the omasum, the muscular bands contract to prevent its passage, and by that contraction drive it into the substance of the stomach."

Youatt describes the following case of true vomition, which

he considers so singular as to deserve to be put upon record: "An ox presented the following appearances: the hair rough; the skin dry and adherent; the muzzle dry; the appetite diminished; rumination slow and seldom; and slight tension of the left flank. Having heard that the animal occasionally vomited, the practitioner determined to remain awhile in the stable in order to satisfy himself of the accuracy of the account. In about an hour rumination commenced, preceded by deep and sonorous eructations having a penetrating odour. This lasted about ten minutes, after which the animal got up, backed himself in his stall, hung on the chain, his fore limbs trembled, he brought his hind extremities as much as possible under him, and bent his neck, and depressed his head, and, after a deep and powerful inspiration, he vomited fifteen pounds of semifluid matter, perfectly triturated.

"The vomiting ceased, the ox remained for a moment motionless, and then lay down again, and ruminated afresh. He continued this about thirty-five minutes, when he had a renewed fit of vomiting perfectly similar to the preceding.

"This was the only one of the herd that vomited, but the others were constipated and hide-bound, and in every way out of condition. The cause of this was supposed to be that the animals were driven nearly a league twice every day in order to be watered, at a time when the heat was excessive.

"They were ordered to be oftener watered, and that at home; and the one that vomited was bled, physic was administered, and the sickness almost immediately ceased.*

"It is impossible to doubt the accuracy of this account, or that it was a case of true vomiting. The matter discharged was semifluid and well triturated; and, consequently, could neither come from the rumen nor the many plus. The same author, M. Creuzel, relates other instances of what he terms vomiting, but evidently ejection of the contents of the rumen: all of them were connected with hoove, and in every case the animal experienced immediate and perfect relief."

* *Journal Pratique*, 1830, p. 322.

HOVEN (ACUTE TYMPANITIS).

This affection, which is known by a variety of terms, as *hovee*, *blown*, *dew-blown*, *jog-sickness*, *grass-sickness*, etc., is one familiar to most agriculturists, but it is more especially prevalent on grass farms. The above different terms denote the nature, cause, and periods of attack. Tympanitis, from tympanum, or *τύμπανον*, a drum, is so called from the drum-like condition of the stomach. *Hove*, or *hoove*, is an old Anglo-Saxon term signifying "puffed-up," or blown. Dew-blown and fog sickness were names given to it on account of animals being frequently affected during early morning and evening, owing probably to the dewy condition of the herbage at the two periods of day named, and to the watery vapours in the atmosphere when foggy. It has been termed grass-sickness, as the affection often follows a greedy meal of rich, succulent, natural, or artificial grasses. From the suddenness of attack and rapidity of its course and frequently fatal termination, it is very essential all cattle-owners should be well versed in the nature, causes, and treatment of hoven.

Causes.—The principal cause of hoven is fermentation of the food, and the consequent elimination of gas in the rumen or paunch. The food most prone to undergo this fermentation, as already pointed out, is rich succulent grass, or that bedewed with moisture; all animals eat more or less greedily on being first turned into the pasture, and if it be a fresh one, particularly young clover, lucerne, or vetches, they rapidly, and with scarcely any mastication, gorge themselves with the tempting morsel. The passage of atmospheric air taken down in rapid and large gulps materially assists in the process of fermentation, and adds to the accumulation of gas. This unnaturally overloaded condition of the stomach soon induces suspension of the peristaltic action of the organ; hence the digestive process being checked, active fermentation, as already observed, soon follows. Decomposed or frosted roots, particularly mangolds, will also give rise to hoven.

"An additional cause of retention in the rumen is found in disease of the salivary glands. Fluorens asserted that from the period of feeding to that of rumination there is a constant abundant secretion of saliva, which is constantly swallowed; if this be stopped, the contents of the rumen become hard and unfit for

regurgitation. In this way rumination is suspended, and tympanitis induced. These observations have been confirmed by Colin, who also found that if the parotid ducts were opened, and the secretion thus prevented from flowing into the mouth, rumination became suspended."—*Williams*.

Symptoms.—These are very palpable; immediately above the left flank the animal is blown out, or unusually large, and as the gas accumulates the part becomes enormously distended, as though on the point of bursting; percussion reveals a tense drum-like condition; the animal stands obstinately in one position with extended head and bloodshot eyes; the breathing is laboured and accompanied with moans and grunts; pain is manifested from time to time by the animal striking its belly with the hind feet.

As the disease proceeds, the distension increases, and the principal enlargement of the rumen is less prominent in the general swelling that takes place; the eyes become more bloodshot, vacant, and staring; partial insensibility ensues; the animal reels about; the breathing is more difficult, the grunting frequent, the teeth grated, pulse feeble, extremities cold. At last the poor creature falls, sour eructations and discharge of ingestion issue from the nostrils, and death from suffocation, owing to the inordinate diaphragmatic pressure, speedily takes place.

Post-mortem Examination.—This usually reveals a mass of sour fermenting ingesta in the rumen, the lungs loaded with dark blood (congested), and the brain also more or less congested.

Treatment.—Hoven admits of no delay or experimental treatment by medicine—escape of the confined gas is immediately necessary; and this is to be afforded by puncturing the rumen, which, if done a hand-span from the last rib and lumbar vertebra, may be performed with impunity. A common pointed knife or lancet will answer the purpose when the trochar is not at hand; but the latter instrument is more serviceable, as its sheath or canula can be left in so long as gas continues to accumulate, a cork being placed in when no escape takes place. Instant relief usually follows this operation; immediately after its performance medicinal agents of properties necessary for the neutralization of the gas should be administered. Of these I have found none better than the arom. spts. of ammon. in $\frac{1}{4}$ to 1 ounce doses, or carb. ammon. in 4 drachm doses in a small quantity of warm water, repeated every

hour as long as required. The sulphite of soda in 1 to 2 ounces has been spoken of to me favourably by some veterinary surgeons; others prescribe the liquor ammon. and ginger; whilst chlorinated lime, chlorate of potash, and vinegar (the latter in my opinion very questionable) have found favour with others.

An aperient when the urgent symptoms have subsided is always advisable, and linseed oil forms the best agent; it insinuates itself through the impaction, and induces no inflammatory action.

ENGORGED RUMEN (PLENALVIA).

This affection, which is commonly known as *Grain-sick*, or *maw-bound*, is very frequently seen in cattle.

Professor Simonds observes in his lecture on this subject: "The stomach is not only filled to repletion, but over-filled; sometimes mere change of food will give rise to it. In the London dairies, from being fed on brewers' grains, cows very frequently engorge themselves; but this kind of food does not require remastication, and consequently sooner passes off, so that in the London dairies it is not of so serious a character. The same change, however, happens in the country; if the animal is put on turnips in the autumnal period of the year, it often brings about this condition of the rumen. We find, however, some of our worst cases of plen-alvia proceed from being fed on bad innutritious provender, and it is the poor farmer whose cattle are chiefly affected, as his cows being dried, they are turned into the straw-yard until they calve, having nothing but straw to live on, and often deprived of water. We also find the general condition of the organism affected by this change. They are not unfrequently in a debilitated impoverished condition, causing inertia of the coats of the stomach from over-distension with this dry poor food, which has to be ruminated over and over again before it is fit for digestion."

"These cases usually come on gradually, and not suddenly, as in tympanitis, and hence are more difficult to deal with; but some do take place suddenly. An instance occurred where a cow had engorged herself with chaff at the barn-door, and the veterinary surgeon who attended her injected a large quantity of warm water into the stomach, which, causing reaction, produced

vomiting, and thus unloaded the rumen; for when the stomach-pump was withdrawn the animal vomited a large quantity of chaff, and in a short time quite recovered.

"But," he observes, "if these means are adopted without due care, we shall in nine cases out of ten be unsuccessful. He once attended a case himself where the animal was suffering from engorgement and he injected such a large quantity as to produce death by asphyxia from the stomach being so enormously distended with water as to press upon the diaphragm and cause the above fatal result. Good may be often done by giving small quantities, and a great deal of harm from large. Sequel: There are cases which are frequently followed by inflammation of the rumen; in fact, this result is more likely than anything else."

To this sequel I take exception, so far as my own experience is concerned; indeed, it is surprising how long impaction of the rumen, particularly with chaff, may be maintained without developing the least symptom of inflammation.

Symptoms.—Engorgement of the rumen speaks for itself—an unusual enlargement in its region is observed, and this enlargement is of a solid and sometimes lumpy nature; there is seldom any elimination of gas, so that the usual drum-like condition noticed in tympany is absent, percussion yields to a dead sound, and the substance, if kneaded with the fist, may be indented and altered in shape. Professor Simonds remarks: "The rumen being in this state, and having lost the power of action or contractility in its coats, the animal is incapable of rumination, and constipation follows as a consequence. The animal also stands obstinately; or, if recumbent, lies obstinately; if standing, the legs are gathered under it, the back arched, and head down. The alteration in the character of the breathing is somewhat peculiar, owing to the weight the abdominal muscles have to bear from the engorged condition of the rumen, and their regularity as muscles of respiration is very likely to become impaired from this unnatural weight upon them; hence we have a long expiratory effort and a short inspiratory one.

"We don't find as a rule much disturbance of the pulse at the onset, for it very often happens when the stomach is affected the brain sympathises, causing a lessening of the heart's action; so that instead of being accelerated, it is in such cases at first rather the

reverse. But after a while it rises to eighty or ninety, and becomes somewhat cordy; the animal evinces great pain on pressure over the rumen, and moans. There is also obstinate constipation, fever, dry muzzle, and an injected condition of the conjunctival membrane, with a fluctuation of tears. Some animals become excited, bellow, and thrust their heads into everything; this condition is chiefly present in those cases where there is an inflammatory state from functional derangement due to the engorgement."

Grunting also accompanies impaction of the rumen, and occasionally in protracted cases a cough is attendant, due to continued diaphragmatic pressure. These two symptoms, associated with laboured breathing, may mislead the casual observer, and lead him to suppose he has a chest affection to deal with;* but a careful observance of the general symptoms, auscultation, and the test of the thermometer, will soon disperse any such idea.

Treatment.—"Injectives of tepid water are very useful, but never inject more than 8 to 10 pints, and that frequently. The next thing is to get the rumen to contract on its contents, and for this purpose we must use a cathartic medicine. Some people administer a bolus instead of a draught, as being more likely to remain in the stomach; and certainly if there is one disease more than another where it would be admissible, it is this one. If a draught is given it should be one which will act on the walls of the rumen, as compound tinct. of aloes in combination with

* Very recently a case of this description came under my own observation: an aged milch cow, suffering from engorgement which had not yielded to treatment of the attendant professional man, in whose mind some doubt arose as to the nature of her complaint. She was notified to the police as affected with contagious disease, and pronounced by the veterinary surgeon called in by him to be a case of pleuro-pneumonia, and slaughtered accordingly. An examination of a portion of lung by the first veterinary surgeon proved the opinion to be an erroneous one, and the subsequent post-mortem inspection by myself confirmed his report. I found the lungs absolutely free from any trace of pleuro-pneumonia. But the rumen was enormously distended with chaff, over a bushel being removed from this viscus, and which was estimated to have been present at least a fortnight, inasmuch as the animal had been living the whole of that time on linseed and gruel; hence, owing to this distension and suspended peristaltic action, the grunting and laboured breathing which was mistaken for symptoms of thoracic disease. The liver was of a pale clay colour, and the gall-bladder empty, showing this organ had been inactive, and consequently the digestive functions were incomplete.—*J. W. H.*

sulphate of magnesia, and a stimulant, as pimento or ginger. But we must remember that after the administration of the medicine the contents of the rumen go into a state of fermentation, so that we should afterwards give the aromatic spirits of ammonia.

"If the derangement is punctual, movement of the animal will be beneficial, but not if inflammation exists. Friction also over the abdomen should be used, as it will tend to expel gaseous matter."—*Professor Simonds.*

For my own part, I prefer large doses of linseed oil and frequent enemas, with, in fermentation—as neutral agents—aromatic spirits of ammonia in 1 ounce doses, carbonate of ammonia in $\frac{1}{2}$ ounce doses, or sulphite of soda from 1 to 2 ounces. In lieu of these agents brandy may be administered with benefit.

Finlay Dun recommends $\frac{3}{4}$ of a pound each of common and Epsom salts, 25 croton beans, or 2 drachms of calomel, with 1 pound of treacle; the beast encouraged to drink freely; soap-and-water clysters thrown up every half-hour, and the abdomen rubbed and fomented. If the bowels are not moved in fifteen or eighteen hours another smart dose of physic must be given; and if dulness increases, 1 fluid ounce of the medicinal solution of ammonia, 4 drachms of the carbonate of ammonia, a wine-glassful of oil of turpentine, of whisky, or of gin, or a full dose of any other stimulant, must be given, and repeated at intervals of one or two hours. When no relief is obtained by any of these measures the only resort is to open the rumen and remove the contents. (See "Rumenotomy.")

After a case of engorgement the diet for a few days should consist of soft and easily-digestible food.

INFLAMMATION OF THE RUMEN (ALVITIS).

In protracted cases of engorgement the lining membrane of the rumen sometimes becomes inflamed. Such a condition is denoted by an accelerated pulse, quickened breathing, pain on pressure to the side, a staring coat, dry muzzle, and the usual accompaniments of inflammatory fever.

Treatment.—Professor Simonds and other authorities advise the withdrawal of blood and the administration of saline aperients and

alkalies. Personally, I have little faith in bleeding or in saline aperients where there is inflammation of the lining coats of the stomach. Large doses of linseed or salad oil answer the best purpose in relieving constipation without stimulating the already inflamed membranes, and also by reason of their oleaginous properties shield the irritated surface. For the alleviation of pain and to neutralise acidity, opium combined with alkalies is most beneficial.

Opium }
Sodæ Bicarb. } aa 2 to 4 drachms,

in a pint of tepid water, and repeated in three or four hours, if necessary.

Hot fomentations over the region of the rumen should be continually persevered with, and the surface of the body kept warm. Food of a mucilaginous nature and tepid, as linseed tea or well-boiled oatmeal gruel, should be given sparingly.

"We may have," says Professor Simonds, "alvitis from dessurrection on depraved appetite, which especially happens when the animal is pregnant, such as eating linen, pieces of wood, bones, etc., and it is a common occurrence for the cow to eat the placental membranes after calving; as however the latter does no harm,* and comes away piecemeal through the intestinal canal, we had better leave it to nature.

"In the same way sows will eat their young ones. In fact, we frequently find herbivorous animals at this period will become carnivorous ones. But when the rumen is engorged with such substances as linen, etc., the best thing is to perform rumenotomy at once."

HAIR-BALLS

"Very rarely cause injurious results, because they are easily broken up and pass on through the intestinal canal. They are

* I have known instances of great constitutional disturbance and intestinal irritation produced by eating the placental membranes, and frequently this is one of the obstacles against purgation in parturient apoplexy. In more than one post-mortem I have found these membranes *en masse* and in a state of decomposition.—J. W. H.

very frequently found in calves, and are formed by the calf sucking the dam and taking in the hair of the cow, or by licking itself. It is not unusual to find in the rumen after death several of these concretions. Youatt states that never more than four are found. He (Prof. Simonds) has taken out nine. They do not produce any untoward results, except when they ascend into the œsophagus and cause choking. If they remain in the rumen any length of time they become coated over with phosphates. It is rather remarkable that they do not pass into the fourth stomach more frequently. He did not know of a single instance of this having occurred, the reason of which is they are presented at the small opening in the rumen and are there rejected.

"The same concretions are found in lambs from a similar cause, and are called wool-balls, but they do not cause death.

"Similar concretions are found made up of the hairs of the plants they feed on. They possess a felt-like or velvety appearance. If they should pass on into the intestinal canal and cause obstruction we should ascertain how the animals have been fed, and not keep them too long on pastures with long-haired plants."—*Prof. Simonds' Lecture.*

INFLAMMATION OF THE RETICULUM.

Inflammation of the reticulum or second stomach, commonly termed the honeycomb, may be dependent on sympathy with disease of the others, but more frequently arises from direct injury to itself, and this is generally caused by the presence of foreign substances. M. Dupuy, of the Veterinary School of Toulouse, records the following narrative: "A bull, three years old, died after an illness of fourteen days. The symptoms scarcely extended beyond the peculiar heaving and short cough of hoove. On examination, after death, it was found that the second stomach adhered to the diaphragm by a false membrane, which was clearly the consequence of intense inflammation of that stomach. The coats of the reticulum had been pierced, and in the aperture was a piece of iron wire that had penetrated through the diaphragm and the pericardium and entered the right ventricle of the heart. Within the diaphragm, and between it and the heart, was a sac containing

nearly a pound of blood mingled with the liquid food usually contained in the second stomach.

"This mischief had been of long standing, for the walls of the ventricle were become white and of a cartilaginous structure, and the ventricle itself was filled with coagulated blood deposited layer upon layer. The pericardium was contracted and adhered to the heart, and might almost be said to have disappeared. The lungs were emphysematous, and contained numerous encysted tubercles resembling hydatids, or actually being so.

"The writer of this treatise has frequently seen inflammation of the second stomach—sometimes accompanying that of the paunch, and at other times seemingly confined to the reticulum. The inflammation was, as in the rumen, characterised by the peeling off of the cuticular coat, and the redness of the tissue beneath it; but the symptoms were so different in different cases, and always so obscure that no legitimate conclusion could be drawn from the appearances that presented themselves."—*Youatt*.

Symptoms.—These usually, as just observed, are obscure. Such an animal frequently thrives badly—is troubled with eructations and flatulency, the appetite is variable, rumination irregular, intestinal irritation is manifested through digestion being interfered with, and diarrhoea is therefore often attendant. Soon the animal becomes emaciated, indications of pain are exhibited by moans, grating of the teeth, and increased breathing, and finally death takes place. A post-mortem may reveal the presence of abscess on the wall of the stomach, adhesion to the diaphragm, or other complications arising from the position of the offending article, if it be due to such, or extended inflammation, and sloughing of the mucous membrane lining the stomach.

Treatment.—This is seldom satisfactory. Oil may be administered, and frequent mucilaginous drinks; but when a successful diagnosis can be made before any advanced symptoms have taken place, the butcher is the best resource.

INFLAMMATION OF THE OMASUM.

Inflammation of the omasum or third stomach, the many-plus or manifolds, usually known as fardel-bound, is of very common oc-

currence in cattle. Regarding this organ and its disease Professor Simonds observes: "It is not a true digestive organ, but prepares the food for its passage onwards. Its internal surface is curiously arranged in folds or leaves varying in length and size, called the many-plus.' It is thought by most people that the office of this stomach is to grind the food down. He does not, however, agree with this theory, because, in the first place, the omasum has the thinnest muscular coat of the four stomachs, and the most vascular; in fact, in some parts of it there cannot even be said to be two layers of muscle, and if destined to grind down the food it would have been provided with a thick muscular coat. "Its function," he says, "is to compress the food, and not rub it down; neither is there any muscular tissue existing between the leaves, so that no such power as hooking up the food, as people say, is possessed by them. But as the ingesta passes into it, it comes in contact with these leaves, and is split up into layers, which are divided and subdivided again as they pass on, on account of the leaves being multiplied." (For anatomical conformation, see commencement of the Chapter.) "With regard to inflammation of this stomach, it is rather the quality than the quantity of food which causes the retention, such as hay-seeds, clover-seeds, and vetches, all of which will be retained a longer time than thin green meat. Provender containing a deal of woody fibre is also likely to cause it, or irregular feeding. For instance, an animal goes into a pasture, gets a bellyful of perhaps poor, innutritious food, comes up to be milked, has hay or corn, and is then turned out again; and so, by this irregular way of feeding, and with different kinds of food, the stomach contains partly hard dry material, and partly moist, causing retention at first, with partial and afterwards obstinate constipation. We therefore trace this disease to the peculiar office of the stomach, the manner in which the animal is fed, and the kind of food given. All such material as is hard and not remasticated is likely to produce it. We have then to look what will probably take place as a consequence of this imprudence on the part of the owner. First, there is a blocking-up, with functional derangement; and this leads to increased vascularity, which is followed by an inflammatory condition of the organ."

Symptoms.—"It is somewhat difficult to diagnose a case of inflammation of the third stomach, because it may be complicated

with disease of the other stomachs, or the inflammation may extend to the intestinal canal. But taking the ordinary indications, we first have a considerable disturbance of the digestive organs as a whole; there is also diarrhoea, which is succeeded by obstinate or unyielding constipation; the pulse is very little increased; the animal loathes its food, but shows scarcely any pain except when diarrhoea is present. These symptoms are caused by the impaction of thin layers of hard dry material between the leaves or manifolds, and the ingesta becomes in this state as follows: The food passes into the omasum in a semi-fluid condition, and by compression of the leaves the moisture is driven out; the increased heat in inflammation dries it, giving it in some cases the appearance of being baked, and rendering it quite brittle. There is no mucus mixed with the evacuations, but they are sometimes accompanied with crude ingesta. The pulse rises to 80 or 90, is wavering, and not strong. The breathing is accelerated, but it is very rarely painful, such as moaning or grunting. There is weeping of the eyes, with an aqueous discharge. There is also frequent redness of the buccal membrane, but no exudation or desquamation.

The whole of the stomach is not always involved. I have seen cases in which one portion of the leaves contained hard, baked-like ingesta, whilst the other portion had moist green food between. In protracted cases the impress of the papillæ will be perfectly stamped on the caked mass of ingesta. As the suspension of the stomach's functions continue, the secretions become dried up, the lining membrane peels off, and intense inflammation of the exposed surface supervenes. Symptoms of inflammatory fever are present throughout, increasing as the disease remains unrelieved. The brain sooner or later sympathises with the stomach, the eyes become bloodshot and staring and then amaurotic, the animal staggers about, and falls from time to time convulsed. In other cases the poor creatures are frantic, and rush madly about. Finlay Dun observes: "No derangement of the digestive organs of cattle is so common as this. It presents itself in all degrees of severity, sometimes as a mere 'loss of cud,' sometimes accompanied by obstinate constipation, brain symptoms, and death. It is the condition that constitutes most of the cases of indigestion of stall-fed beasts, and is the invariable concomitant of all fevers and inflammations. It is of most common occurrence in summer and autumn,

when there is abundance of strong, tough, hard grass. When a fresh sweet bite comes up amongst the old withered foggage in autumn, fardel-bound is frequent; for the animals, anxious to get the new succulent grass, swallow along with it considerable quantities of the old indigestible stuff. Rye-grass in seed and ripe vetches are also prolific sources of it. Cases occur where cattle eat largely of hedge-cuttings or shoots of trees, and hence its synonym of 'wood-evil.' Sometimes it results from continued high feeding, with insufficiency of water, and occasionally it will follow even a few hearty meals. It is very apt, as has been said, to show itself during or after any febrile attack—on account, doubtless, of the natural secretions of the stomach, like those of other parts, being temporarily dried up; and is, for a similar reason, most prevalent during hot summers and when water is scarce.

"The symptoms manifest a very variable intensity, and are often a few days before they become very prominently observable. Rumination is suspended, the animal refuses its food, and, if a cow, yields little or no milk. After a day or two there is fever, indicated by the nose and mouth becoming hot and dry, the surface of the body alternately hot and cold, the tips of the horns cold, the roots hot, with somewhat accelerated circulation and respiration. By the second or third day there is a grunt at the end of inspiration and commencement of expiration, which is especially observable when attempts are made to move the animal; and this symptom has again and again misled tolerably acute practitioners into the belief that they had to deal with a case of pleuropneumonia or some such lung complaint. The round, hard, resisting stomach can be felt by pressing the closed fist upwards and forwards underneath the short ribs on the right side. In all cases there is obstinate constipation, and any dung that may happen to be passed is dark-coloured, caked, and often of different degrees of consistence, presenting frequently hard cakes amongst soft matter. Often the first stomach is considerably distended, and the urine high-coloured. Having most of these symptoms, the animal may live for ten days or a fortnight; but, unless relieved, the nausea gradually increases, the pulse becomes very small and scarcely perceptible, and the strength fails. In some seasons extreme stupor precedes death, as in many cases of stomach-staggers in the horse; whilst in others, quite inexplicably, the patients become

much excited, and throw themselves frantically about. In a few days epileptic fits are seen. After death the third stomach is hard and heavy, and between its leaves are found dry caked portions of dark-coloured dung and imperfectly digested food, often of a kind that the animal has not partaken of for several weeks. So dry are the contents, that they look as if they had been baked in an oven, and will often rub down into a fine dry powder. The cuticular coat investing the leaves is stripped off; and in all cases where the brain is much involved inflammatory action is traceable, never showing itself, however, in the exudation of lymph or the outpouring of pus, but simply in the removal of the cuticular coat. Occasionally the inflammation extends to the fourth stomach and intestines."

Treatment.—Mr. Dun's treatment is also so clearly rational that I shall take the liberty of transcribing it: "This consists in removing the obstinate constipation by powerful purgatives, advantage being taken to gain their utmost efficacy by combining several together, and giving them along with plenty of fluid. Three-quarters of a pound each of Epsom and common salt, 20 croton beans, and 1 drachm of calomel will suffice for a full-grown middle-sized ox or cow, and must be administered in three or four bottles of water or very thin gruel. In this disease there is little fear of giving too much medicine. I have known a cow have within two days 12 pounds of Epsom salts, 12 pounds of treacle, and several bottles of castor oil, without effect; and as it is never advisable to give small and frequently repeated purgative doses, large quantities must be administered at the onset. Their action is greatly expedited by the use of occasional stimulants, which in diseases of the digestive organs of cattle may be given without fear of engendering or aggravating inflammation. Every encouragement must be used to get the animal to drink, for large quantities of fluid are obviously most essential in washing on the obstruction which causes the evil. The cessation of the grunt, the passage of some hard cakes of dung, with the subsequent abatement of the fever, are the signs of amendment for which we watch; but even after the first movement of the bowels, considerable attention, a sloppy diet, and several doses of purgative medicine are requisite to empty the canal and prevent the recurrence of the obstruction. If twenty hours elapse after the administration of the above com-

lination without any action of the bowels, the same dose may be again repeated, along with a good quantity of some stimulant, such as a bottle of ale, with 2 ounces of oil of turpentine, and 2 ounces of ginger. Half the quantity of the purgative may be given at the end of a like interval if no effect be produced ; but the further employment of purgatives is injurious, inasmuch as it increases the nausea without expediting the action of the bowels. A week will sometimes elapse without any alvine evacuation ; in some cases I have known ten or eleven days, and in some fifteen days. Yet even in these recovery took place ; and so long as stupor and frenzy are staved off, there is always hope of a cure. After the prompt and energetic adoption of the treatment recommended, little further remains to be done, except to withhold all solid and indigestible food, administer frequent quantities of water or any simple fluid, which must be horned over if the beast will not take it ; allow also plenty of treacle, and encourage the action of the medicine by clysters, scalding the belly, and occasional exercise. Blood-letting is not only useless, but even injurious."

I will just add, from my own experience, that I have found large doses of linseed oil very beneficial in this disease. As Professor Simonds observes : "We are more likely to get a removal of the ingesta out of the third stomach by it, because, to a considerable extent, oil is a mechanical agent ; it has a tendency to float on nearly any fluid, and this is one reason why it is so beneficial, as by floating on the fluid in the rumen it is more likely to pass on into the third stomach ; and, being of a very penetrative nature, it works its way into the ingesta, softens, and breaks it up." Again, in obstinate cases of fardel-bound, I have found 30 to 40 drops of croton oil, well blended with a pint of linseed or salad oil, act more expeditiously than any of the other aperients.

For some few days after recovery the diet should consist of sloppy and mucilaginous matters, and the return to solid food should be gradual and cautious.

GASTRITIS.

Gastritis, or inflammation of the abomasum or fourth stomach, is somewhat rare in the ox, and is more generally seen in those worked in the team.

Causes.—Drinking largely of cold water when overheated, interruption of rumination during work, extension of inflammation from the third stomach. "It cannot be said to occur from over-repletion, except in the young before weaned, where the milk passes into the fourth stomach, is formed into curd by the action of the gastric juice, and then being broken up may possibly produce over-repletion; but in the adult it is not so, as no food is allowed to pass into the fourth stomach until fit for digestion."—*Simonds*.

Symptoms.—As in all inflammatory conditions of the abdominal viscera, considerable constitutional disturbance is manifested. The pulse is accelerated, the breathing hurried, the visible mucous membranes injected, colicky pains are exhibited, and there is general tenderness over the abdomen, with a more or less relaxed condition of the bowels.

"In the gastritis of ruminants a highly disturbed condition of the nervous system is a distinguishing symptom, evidenced either by a high state of delirium, coma, or convulsive fits, indicative of disturbance of the brain proper, or by paralysis of the posterior extremities, when the area of the disturbance is limited to the posterior parts of the spinal cord.

"In addition to the above symptoms, the gastritis of ruminants is characterised by more or less diarrhoea, soon succeeded by an apparent obstinate constipation, which, however, is not due to an obstruction by impacted food, but to cessation of the peristaltic action of the intestines, the contents of the stomach being found generally more or less fluid after death.

"In many instances the animal strains violently, and passes both blood and mucus, showing that the inflammation has extended into the intestinal canal, and it is said that a hard swelling may be detected on the right side, arising from distension of the third stomach. In many cases, however, general swelling of the abdomen, tympanitis, supervenes early in the disease, and greatly adds to the animal's suffering."—*Williams*.

Treatment.—The treatment of gastritis is essentially anodyne. It must be borne in mind we have a large surface of inflamed and therefore highly irritable mucous membrane, and that whatever may be administered will come more or less in contact with it; drastic purgatives and stimulants are therefore to be especially avoided; sedatives and antacids are the most appropriate agents,

and, as a mechanical aperient, a dose of linseed or salad oil may be given.

Professor Simonds advises bleeding, counter-irritants over the abdomen, particularly the right side, with slight aperients and sedatives, as tinct. opii and oil, and the administration of mucilaginous drinks.

Professor Williams remarks: "The constipation results from a loss of function rather than impaction, and we will do well to recommend a course of treatment calculated more to modify inflammation than to overcome the seeming constipation. For this purpose, sedatives, such as aconite or belladonna, with antacids—bicarbonate of soda or potash—and one, or at most two, moderate doses of an oleaginous aperient, with an abundant supply of fluids for the animal to drink, with fomentations to the abdomen, and enemas, are to be prescribed. This treatment is much more calculated to save life than the indiscriminate use of cathartics and stimulants. I speak advisedly, having witnessed many animals destroyed by the administration of repeated doses of cathartics in order to overcome constipation in this affection, the parties prescribing perhaps not being aware that an inflamed part loses its function, and that before the function and the peristaltic movement of the bowels be restored the subsidence of the inflammation is essential, and that such inflammation is much more likely to be increased than diminished when the inflamed tissue is irritated by drastic cathartics or other remedies, which are supposed to rouse up the action of the bowels. If passage of the faeces is not restored in the course of twenty-four hours after the administration of the aperient, it does not follow that it is necessary to repeat it; time must always be allowed in all inflammatory diseases for the inflammation to subside, and for the weakened or debilitated parts gradually to resume their normal functions. The late Professor Strangeways was very successful in the treatment of this affection. At the commencement he gave a dose of oil, with sedatives, and after the febrile symptoms had to some degree subsided, from 8 to 12 ounces of sulphate of magnesia, 15 grains of quinine, and a few drops of sulphuric acid, ample time being allowed before any additional cathartic was given. It was very seldom necessary to repeat the medicine, as the bowels became gradually restored to their natural healthy condition."

FOREIGN BODIES.

Probably there is no animal the veterinarian has to deal with in which so varied an accumulation of foreign bodies in the stomach are met with as in horned cattle. To the amateur the swallowing of such articles as nails, clothing, shoes, etc., would appear almost incredible. Yet many cases are recorded; and several have come under my personal notice of substances even more extraordinary, and in such excessive bulk as to render it a matter of amazement that the host should have lived in apparent health. The rumen and reticulum are the compartments in which these bodies are found, but chiefly in the former. The rumen also harbours specimens of *Tænia*, and to its outer surface the *cysticercus tenuicollis* has been found attached. Youatt observes:

"There are some singular records of this depraved appetite, if so it may be called. The museum of the veterinary school at Alfort contains a calculus that was taken from the rumen of an ox, and the nucleus, or central body, around which the vegetable and slimy matter gradually formed and hardened, was a woman's neckerchief, without one laceration in it. In the same museum is a pair of scissors, to which a cow had taken a fancy, and which had worked their way through the coats of the stomach, and at length begun to protrude between two of the ribs, whence they were extracted. It was necessary to break the rivet by which the blades were united before their removal could be accomplished. Another cow swallowed a similar pair, but these were arrested in their passage down the throat, whence they penetrated into the thorax, and at length protruded between two of the ribs. An old shoe was found in the paunch of an ox; and the lash of a whip, with part of the handle attached to it, began to elevate the left flank of a cow, and was extracted after an incision had been made upon it. An ox, destined to be slaughtered, was led to the abattoir, where the man in attendance had taken off his waistcoat, and left it in the slaughter-house, from which he was called away for a few minutes. On his return the waistcoat was missing, and his companions were accused of the theft, or trick; but it was presently found in the paunch of

the beast. A cow exhibited symptoms of choking, and was in extreme distress. There was evidently no obstructing body in the portion of the gullet above the thorax, nor could it be detected lower; yet the symptoms were those only which could be referred to the lodgment of some foreign body in the gullet, or the orifice of the stomach. A large incision was made in the left flank, sufficient for the admission of a man's hand; that incision was carried on into the rumen, and a buckskin glove was abstracted, that had been fixed between the pillars of the floor of the oesophagean canal, between which lies the entrance into the rumen.*

"The presence of bodies like these in the rumen cannot fail of being injurious to the animal. They must produce local irritation, interfering with the proper function of the stomach; suspending the process of rumination, or rendering it less effectually performed; and exciting inflammation, probably of the stomach generally, as this foreign body is traversing its different compartments, or of some particular portion in which it may be accidentally arrested and leading on to abscess and perforation of the stomach at that spot. During the strange journey of these bodies through the various parts of the frame, previous to their final expulsion, and while they are, as it were, seeking a way of escape, they cannot fail of producing much serious indisposition. The symptoms which would indicate this peculiar cause of disease are not yet sufficiently known; but there must be considerable disturbance when a body sufficiently hard and pointed thus to force its way commences its journey. Inflammation, as conducting to suppuration and destruction of the lining substance, must precede its course and make way for it; and as it passes along, the aperture closes, and the wound is healed behind it. The nerves and bloodvessels which lie in its way are, with mysterious skill, unerringly avoided, and as little injury as possible is done to the neighbouring tissues; but local inflammation and pain attend the whole process. and, in many cases, are accompanied by general and severe disease.

"It is seldom that medical skill could be of avail here, until the

* *Vide* "Réueil de Médecine Vétérinaire," 1830, p. 324; "Mémoires et Observations sur la Chirurgie et la Médecine Vétérinaires," tome ii. p. 360, et "Dict. Vétérinaire," par Hurltel d'Arboval, "Corps Etrangers."

substance approaches to the skin, even if the case were understood. All that can be done is to prevent the animals, as much as possible, from having the opportunity of swallowing these things."

Cases have come under my own observation, where large quantities of nails and portions of wire have been found in the rumen after death, without apparently incommoding the animal during life, whilst on the other hand these have pierced the walls of the rumen and the diaphragm, passed on to the heart, and caused death.

CHAPTER VII.

DISEASES OF THE BOWELS.

Constipation.—Diarrhoea.—Dysentery.—Colic.—Enteritis.—Enteritis Exudativa.—Gastro-Enteritis.—Intussusception.—Strangulation.—Stricture of the Rectum.—Protrusion of the Rectum.—Tumours of the Rectum.—Imperforate Anus.—Fistula in the Anus.—Piles.—Hernia.—Peritonitis.

CONSTIPATION.

CONSTIPATION is more frequently a symptom of disease than an affection of itself. In some animals there is a predisposition to this condition.

Causes.—These may be either structural, mechanical, or functional. The structural or mechanical causes are those arising from some congenital or abnormal condition of the intestines, as contraction, invagination, hernia, or strangulation.

The functional causes are due to insufficient exercise, sluggish bowels, deficiency of bile and intestinal secretions, paralysis, etc.

Symptoms.—These are usually denoted by the character of the faeces and the difficulty in their evacuation. They are hard, glazed, passed in small quantities and at long intervals. The mucous membrane lining the rectum is observed to be unusually red, and in protracted cases the other visible mucous membranes are found to be in the same condition. Unless early relief is afforded colicky pains supervene, and these ultimately lead to inflammatory ones.

Treatment.—Medicinally, either saline or oleaginous agents may be employed; I prefer the latter, especially linseed oil. Hardened faeces in the rectum should be removed by hand; enemata are also serviceable. The food should be of an easily digestible and laxative character, as bran, linseed, pulped roots or green meat. Subsequently, tone may be imparted to the bowels if necessary by the administration of small doses of iron with carminatives. In the

case of structural or mechanical causes, the operations performed in human practice are seldom advisable in cattle.

DIARRHŒA.

This, as its derivation signifies (*διάρρῳ*, to flow out), is a frequent discharge of liquid fæces. It is commonly met with in cattle, particularly young stock, and is generally rather evidence of a disease than a malady itself.

Causes.—These are numerous, and among them may be named derangement of the stomach, liver, and pancreas; local irritants, indigestible food, sudden changes of diet, impure water, acidity, worms, abuse of purgatives, previous constipation, cold and debility. It also accompanies tubercular disease, pleuro-pneumonia, typhoid and other blood-poisonous and constitutional maladies.

Gamgee* observes: "Cattle are very subject to diarrhœa when placed on young soft pastures, and with sudden changes of diet. It is a symptom of epizootic diseases, such as pleuro-pneumonia and contagious typhoid; whereas it is seen in young animals of all kinds, when a dyspeptic state is induced from an artificial system of rearing, and the milk, unacted on by the gastric juice, passes into the intestine, and produces an active peristaltic movement and its expulsion."

Symptoms.—As already observed, the leading symptom is a frequent discharge of liquid fæces, which is usually accompanied by flatus, and it is this latter that gives rise to the peculiar bubbled appearance of the evacuation. There is also considerable straining, frequent and scanty micturition, occasionally colicky pains, impaired appetite and injected visible mucous membranes. In milch cows the lacteal secretion is often diminished. Gamgee further remarks: "When an irritant is operating locally, the material which produces the disorder is usually to be detected in the excrement. If the stomach is inactive, alimentary matters, such as milk, pass unchanged; hence the name 'white scour' for diarrhœa in calves and lambs. There is also great fœtor, and a black condition of the fæces in blood-diseases which give rise to diarrhœa. Sometimes preparations of iron, given with other astringents, occasion a

* "Our Domesticated Animals in Health and Disease."

peculiar form of diarrhoea, especially if a purgative is incautiously given to the animal receiving ferruginous tonics. The faeces are perfectly black, like ink, and very foetid. Such attacks are sometimes not easily checked. Should the pancreas not act, fatty matters are found in excess in the excrement."

Post-mortem Appearances.—"In the diarrhoea of young animals which proves so destructive amongst calves, and has been improperly designated gastro-enteritis and dysentery, there is no appearance of inflammation; and in the many cases I have examined, there was usually a peculiar pallor or indications of checked function in the fourth stomach and intestines. It is the mass of half-curdled milk in these organs, and the emaciated appearance of the tissues, which may be regarded as characteristic of diarrhoea in sucking quadrupeds. I have never seen thickening or exudations.

"In adult animals the cadaveric lesions vary according to the immediate cause of the frequent alvine evacuations. Ramified redness or signs of determination of blood may be detected whenever an irritant operates locally, but this is often not more than the turgid condition of the intestinal mucous membrane when in active secretion. Disease of the liver, or of other parts of the digestive apparatus, may exist, as well as fluid and scanty contents in the intestine."

Treatment.—The variety of causes operating in the production of diarrhoea render it essential that we should first of all endeavour to ascertain its origin. If it is owing to derangement of the digestive organs these are primarily to be attended to. If to local irritants we should assist nature in her efforts to expel the offending matter, and this may be effected by the administration of $\frac{1}{2}$ of a pound of Epsom salts, combined with 1 ounce of carbonate of soda and $\frac{1}{2}$ an ounce of ground ginger or $1\frac{1}{2}$ pint of linseed oil. Indigestible food, sudden changes of diet, impure water, are causes easily avoided. When diarrhoea is due to acidity, antacids and astringents are called for. If worms are present, their immediate removal is indicated (see "Worms"); and when there is reason to suspect the abuse of purgatives, opiates and astringents, with the free administration of mucilaginous matter, are usually the most beneficial. As a result of previous constipation, we must be careful not to check it too soon, and to do

so if possible rather through the diet than by the use of drugs. When it proceeds from cold, warmth, carminatives and astringents are advisable. When from debility, a supportive and astringent treatment, with tonics, is most beneficial. For diarrhoea associated with tubercular disease, pleuro-pneumonia, typhoid and other blood-poisonous and constitutional maladies—sulphate of iron or copper, combined with opium, tannic acid, sulphuric acid and the barks, with a cautious diet, are the measures I adopt.

For the treatment of diarrhoea in its various forms the following prescriptions are given :

For simple diarrhoea (unless merely due to change of pasture) great benefit appears to have been derived in the early stage of the disorder from

Calomel	} aa 1 drachm (<i>Gamgee</i>).
Opium	

To be given in thick gruel, and repeated after forty-eight hours if the looseness is not checked.

Chlorodyne is also an excellent remedy—from 2 to 4 drachms in a little water or mucilaginous fluid.

Diarrhoea due to Irritants.

Magnes. Sulph.	12 ounces.
Sodæ Bicarb.	1 ounce.
Zingib. Pulv.	2 drachms.

In 2 pints of warm water, or linseed or salad oil 1 to 2 pints.

Diarrhoea from Acidity.

Chalk P.P.	2 ounces.
Opium	1 drachm.

Or

Sodæ Bicarb.	2 ounces.
Catechu	2 drachms.
Opium	1 drachm.

In a pint of thin wheat flour gruel twice or thrice daily.

Diarrhoea (Bilious).

Calomel.....	1 drachm.
Podophyllin	2 drachms.

In a pint of thin gruel once daily.

Astringent Mixture.

Chalk P.P.	2 ounces.
Catechu Pulv.	} aa 4 drachms.
Gentian Pulv.....	
Opium	1 drachm.

To be given in wheat flour gruel.

Tonic Astringents.

Ferri Sulph.....	} aa 4 drachms.
Catechu Pulv.	
Gentian Pulv.	

In a pint of sound ale or gruel.

Tannic Acid	$\frac{1}{2}$ drachm.
Nux Vomica.....	1 drachm.
Gentian Pulv.	4 drachms.

In a pint of sound ale or gruel.

Angustura Bark Pulv.	1 $\frac{1}{2}$ ounce.
Acid Sulphuric	1 $\frac{1}{2}$ ounce.
Aqua	2 $\frac{1}{2}$ ounces.

A wineglassful three or four times daily in water (*Gamgee*).

Ammoniated Sulphate of Copper.

A wineglassful of the solution twice or thrice a day (*Dobson*).

In diarrhœa associated with constitutional disease, opium in 1 drachm doses, combined with sulphate of iron or copper 4 drachms, or sulphate of zinc or acetate of lead 1 drachm, in a pint of stout or gruel twice or thrice daily, will be found serviceable.

In addition to these medicinal agents, mucilaginous matters should be freely administered, as starch, egg yolks, rice water, isinglass, etc., and enemas of similar nature may be advantageously used.

The diarrhœa of calves is very frequently due to the condition of the milk, which may be either too rich, in which case it must be suspended or diluted, or from an altered condition of it through the feeding of the cow, or by reason of its being unacted on by

the gastric juice. For general purposes the following prescription is perhaps the most useful :

Creta P.P.....	2 ounces.
Catechu Pulv.	1 ounce.
Sodæ Bicarb.....	1 ounce.
Zingib. Pulv.	1 drachm.
Opii Pulv.	1 drachm.
Aqua Menth.	1 pint.

For calves a fortnight old, 3 tablepoonsful morning and night until scouring has ceased.

Gamgee recommends "a change of diet, or giving them a little milk frequently, and at the same time giving a tablespoonful of the common rennet, such as is used in making cheese. The white of one egg in water or milk has a very desirable effect."

"There are cases of chronic diarrhoea in horses and cattle that are benefited by mineral astringents, such as acetate of zinc or sulphate of copper. The latter is a very favourite remedy with some practitioners. When the fæces are very foetid, and the prostration very great, the following preparation may be tried :

Chlorinated Lime	2 drachms.
Tincture of Arnica.....	2 drachms.
Nitric Ether	1 ounce.

This may be given in cold water twice or thrice daily.

"Alum whey is a very useful preparation, especially for small and weakly animals. It is prepared by boiling together for ten minutes half an ounce of alum and two quarts of milk; when strained a very useful agent is obtained, and may be given twice daily."

DYSENTERY.

Dysentery or inflammatory diarrhoea, commonly known to the farmer as "Bloody Flux," is a disease of serious import. Youatt observes: "Dysentery may be a symptom and a concomitant of other diseases. It is one of the most fearful characteristics of murrain; it is the destructive accompaniment or consequence of phthisis. It is produced by the sudden disappearance of a cutaneous

eruption; it follows the cessation of chronic hoose; it is the consequence of the natural or artificial suspension of every secretion. Were any secretion to be particularly selected, the repression of which would produce dysentery, it would be that of the milk. How often does the farmer observe that no sooner does a milch cow cease her usual supply of milk than she begins to purge! There may not appear to be anything else the matter with her, but *she purges*, and in the majority of cases that purging is fatal."

Dysentery consists chiefly in inflammation of the mucous membrane lining the colon and rectum, followed by ulceration and sloughing of the mucous membrane with hæmorrhage, hence the term "Bloody Flux."

Causes.—Protracted diarrhoea, blood-poisons, bad food, impure water, sultry weather, and exposure. It may also be associated with other diseases. Some kinds of pasturage are also productive of dysentery, as moorlands, valleys, and shady places. Hence the old names, *moor-ill* and *wood-evil*.

Dysentery assumes three forms—*acute*, *chronic*, and *complex*. The first-named is generally due to active irritant matters or blood-poisons, and attacks young and vigorous animals.

The second is brought about by defective sanitary arrangements, especially those which debilitate the system and interfere with the functions of the skin and lungs, as bad food, stagnant water, insufficient ventilation, exposure, filth, etc. Old animals, and especially those at the close of a long illness, whose systems are susceptible to such influences, are the usual victims of chronic dysentery.

Complex Dysentery.—"During the progress, more especially of chronic cases, various intercurrent morbid states become developed, not necessarily connected with the primary affection, but forming secondary lesions to the disease, and constituting the third form in which *dysentery* must be studied, namely, *complex cases of dysentery*. There are various secondary lesions which render cases of dysentery complex, and which are regarded by some as directly connected with the primary affection. There are also secondary lesions connected with antecedent forms of disease, which sustain a renewed impulse to their development by the dysenteric state. These secondary lesions may be shortly stated to consist: (1) In lesions of the small intestines, and of various solid viscera, more or less connected with the dysenteric state; and (2) In lesions which

may be referred to the co-existence of certain morbid states of the patient with the dysenteric condition, such, for instance, as the *typhous* and *scorbutic*, and the *tuberculous* state."—*Aitken*.

Symptoms.—*Gamgee* observes: "The acute form is attended with severe symptoms of general disturbance, often ushered in by shivering fits. The temperature of the body is very variable; the animal becomes hide-bound, and its coat stares; the back becomes slightly arched, and the loins are sensitive. The eyes are dull, and occasionally the seat of discharge. The mouth is clammy, and the tongue furred and dirty-looking. The animal yawns and grunts, and at short intervals discharges a variable quantity of thin watery excrement and mucus, often tinged with blood. The straining is generally violent and distressing. The animal draws its limbs together, arches its back, extends its tail, and the anus appears sore and red. The urine discharged is often of a dark red colour. The amount of abdominal pain varies considerably; sometimes there is severe colic, and at others general tenderness. Gaseous distension of the paunch not uncommonly complicates the disease.

"The constitutional symptoms are commonly those of a low typhoid disease. The animal is dull, emaciated, and suffers from thirst. An aphthous eruption in the mouth indicates the condition of the intestinal surface, where, in some cases, there are abscesses, and in others there is severe ulceration, whence blood is discharged. Unless by judicious treatment the symptoms are made to subside, they increase in severity, and in a fortnight from the commencement of the disease the animal dies. If the chronic type of the disease declares itself the animal may linger on for a prolonged and indefinite period of time."

"In the chronic cases the general symptoms are very severe, and faithfully enough portrayed by *Youatt*, who says: 'The beast is sadly wasted—vermin accumulate on him—his teeth become loose, swellings appear under the jaw, and he dies from absolute exhaustion; or the dejections gradually change their character—blood mingles with the mucus—purulent matter succeeds to that—it is almost insupportably foetid—it is discharged involuntarily—gangrenous ulcers about the anus sometimes tell of the progress that is going on within: and, at length, the eyes grow dim and sink in their orbits, the body is covered with cold perspiration, and the animal dies.'

"In some cases the emaciation is frightful; the skin cleaves to the bones, and the animal has become a living skeleton; in others there have been swellings about the joints, spreading over the legs generally, occasionally ulcerated; and in all, the leading colour of the membranes, the rapid loss of strength, the stench of the excrement, and the unpleasant odour arising from the animal itself, announce the approach of death."

Pathological Anatomy.—"Ready removal of the epithelium over the first three stomachs, which are usually pretty empty; the third may contain some solid food. The fourth stomach is the seat of reddish discolouration of its mucous membrane, which is occasionally oedematous, and at others the seat of exudation of lymph, which has been said to give to it the appearance of jelly. The small intestine, distended by fluid material, is occasionally injected, but, often presenting no abnormal appearance. The cæcum, colon, and rectum are obviously inflamed; the mucous membrane red with abrasions or ulcerations, varying in extent, and sometimes perforating the intestine. In some cases abscesses exist in the sub-mucous tissue. Ecchymoses, and even spots where sloughing is going on, are apparent in the large intestine."—*Gamgee.*

"The morbid anatomical states which I have been able to distinguish throughout numerous dissections of cases of dysentery, may be stated as follows:

"1. Forms of exudation obvious on the surface of the mucous membrane of the rectum and colon.

"2. Forms of exudation not obvious to the unaided eye, but which were seen, in all the cases examined by the microscope, to fill the mucous tubular follicles of the large intestine.

"3. Forms of exudation obvious to the eye, and demonstrable by microscopic examination as being developed in the solitary vesicular or lenticular glands of the large intestine.

"4. Changes in the exuded material, which tend first towards its organization, and subsequently to its destruction and removal by ulceration.

"5. Softening and ulcerative changes in the tissues of the mucous membrane itself, and in the glands.

"6. Similar dysenteric lesions extending into the *small intestines.*

"The extent of the exudative process varies much. In some

cases a considerable portion of the *colon* and *rectum* only is affected; in other instances not only is the whole tract of the great gut the seat of some form of the exudative process, but the lower portion of the small intestine also. The most commonly affected portions, however, are the *rectum*, the *sigmoid flexure*, and the *descending colon*. When the *caput cæcum* of the colon is involved the *vermiform appendix* participates in the process. Creamy-like exudations have been seen to fill its tubular glands, which in some cases were opened up by ulceration."—*Aitken*.

"If the inflammation has gone on to ulceration, numerous cup-like depressions or ulcers are found, the base of the ulcer being formed of the muscular coat of the intestine; while the mucous membrane on the prominent surfaces of the intestinal rugæ is also destroyed, particularly in the sigmoid flexure of the colon and in the rectum. If the ileum has been involved, the mucous membrane of the inflamed portion—especially that part near the ilio-cæcal valve—will be found vascular and thickened, and have a velvety look. Occasionally Peyer's glands are affected. The mesenteric glands are usually healthy, or only very slightly enlarged, and perhaps reddened."—*Tanner*.

Treatment.—Various measures are adopted for suppressing dysentery medicinally. Anodynes and astringents are decidedly indicated. The sulphate of copper and opium stand pre-eminent, and may be given in the proportions named in the foregoing disease three, or if necessary four, times a day.

Blood-letting in this excessively reducing disease is strongly contra-indicated; injections of starch with laudanum or a solution of sulphate of iron are also very useful.

Gamgee observes: "Calomel and opium, of each 1 scruple, given thrice daily for one or two days, has been attended with great benefit. The severe inflammatory symptoms having subsided, styptic and stimulating remedies, which act topically on the mucous membrane of the intestine, can be prescribed.

"Acetate of zinc, acetate of lead, and turpentine, all given in small doses rather frequently, and in large quantities of thin gruel and decoction of linseed, prove of service. Some veterinarians have obtained benefit from employing drachm doses of sulphate of copper. Alkalies and opium have been combined as follows for cases of dysentery in the cow:

Solution of Potash.....	1 ounce.
Ipecacuanha Wine.....	1 ounce.
Powdered Opium	1 drachm.
Tincture of Cantharides.	$\frac{1}{2}$ ounce.

Mix and give in a quart of warm gruel.

"Hertwig advises the administration of nitrate of silver in doses of 8 or 10 grains for the horse or ox, which may be given in about 10 ounces of cold boiled water.

"Chloride of lime, a drachm to the quart of water, proves beneficial; or the following prescription :

Chlorinated Lime	2 drachms.
Tincture of Arnica.....	2 drachms.
Nitric Ether	1 ounce.

This may be repeated twice or thrice daily, being given in gruel."

Professor Simonds, in his lecture on Dysentery, observes: "In the west of England infusion of box is used to a large extent, which is an astringent. The dose given is the infusion from a pound of the leaves. These large doses undoubtedly do good, because they bear upon the whole intestinal surface of the alimentary canal. It must be recollected we have 160 feet of diseased action going on, and that unless we give large doses to come in contact with the greater part of this surface we cannot expect to effect a cure. Watery effusions are therefore the best to use, as the fluid carries with it, wherever it goes, the whole of its properties, and is not precipitated in one part as chalk. Box is an excellent thing. Galls are still more active. We can make a large decoction and give it in 1 or 1 $\frac{1}{2}$ ounce doses. Catechu is another useful agent, and may be given in the same quantity; or else kino, in about half. He used to give them both in combination, and cummin-seeds as a carminative."

The rules regarding diet in diarrhoea will apply in dysentery, and warmth, cleanliness, and dryness are equally essential.

SPASMODIC COLIC.

This disease is comparatively of rare occurrence in cattle. Probably the anatomical arrangement of the stomach has something to

do with this immunity; for instance, drinking largely of cold water when heated frequently produces colic in the horse; whilst owing to the four compartments of the ox's stomach, the water first taken into the rumen does not necessarily remain there. Again, the ox is not so liable to gastric or intestinal irritation as the former animal; neither is he used for work, excepting on land, as is the horse. It is chiefly among those worked as team-oxen that this disease is seen.

Spasmodic colic consists in violent and spasmodic contraction of the muscular coat of the intestines, and frequently, according to Professor Simonds, that of the rumen and fourth stomach.

Causes.—Drinking cold water when heated, indigestion, the presence of irritant bodies, sudden changes of diet, exhaustion from excessive work or travel, fasting, etc.

Symptoms.—General uneasiness, casting the head from side to side, curling the tail, striking the belly with the hind feet, lying down frequently; the pulse is quickened during pain, and occasionally the animal moans and grunts; intermissions in the pain occur, which is more violent with each attack; unless speedy relief is obtained the animal becomes violent in its paroxysm, and frequently tympanitic.

Treatment.—Four drachm doses of chlorodyne in half a pint of warm water, repeated in two or three hours, if necessary, is an excellent remedy in colic; or 2 ounces of laudanum in a pint of linseed oil may be given with advantage. For domestic use, in lieu of these agents, a pint of whisky with a tablespoonful of ground ginger in a pint of warm water is exceedingly useful. Professor Simonds recommends ol. terebinth 2 to 3 ounces, ether, nitre and tinct. opium of each 1 ounce. If the spasm, he says, does not cease it may be repeated, but with not so large a quantity of the turpentine, as having a secondary action on the kidneys it may produce inflammation of them. For domestic remedies he advises effusion of cummin-seeds, aniseeds, or good warm ale. He condemns the administration of mustard, as it causes irritation of the coats of the stomach, and has been poisonous to these animals.

ENTERITIS.

Enteritis, or inflammation of the bowels, is not such a frequent disease in the ox as in the horse, for the same reasons as are named in the previous malady.

Enteritis is rarely confined to one tissue; both the peritoneal, muscular, and mucous coats of the bowel are generally involved in the inflammatory process. The latter is, however, in all instances more particularly the seat of inflammation, and from the rapidity of its course seldom gives time for the others to equally participate.

Causes.—Protracted colic, exposure to damp and cold, intestinal obstruction from feces, foreign bodies, strangulation, or intussusception, local irritation, or irritant poisons.

Symptoms.—Continual abdominal pain without intermission, indications of the severity of the sufferings are manifested by curling of the tail, moaning, grinding the teeth, lying down, and throwing the head about, flinching on the least abdominal pressure. The breath is taken in short gasps, and there is a bellow-like movement at the flanks; the abdominal muscles being brought into play to avoid diaphragmatic pressure on the inflamed viscera. "Thus," says Professor Simonds, "he breathes quick so as not to augment the pain." The pulse is rapid and cordy, the muzzle dry and hot, the visible mucous membrane injected; the coat is staring and harsh; the extremities are cold, and the horns and ears, at first hot, soon become the same. The feces are rarely voided owing to the pain it gives, and when evacuated they are usually hard, glazed, and often streaked with blood. The exhaustion is rapid, and death, unless wise and active measures are adopted, speedily ends the scene.

Youatt graphically describes enteritic symptoms thus: "The beast that on the preceding day seemed to be in perfect health is observed to be dull, depressed, his muzzle dry, his hair rough; he shrinks when his loins are pressed upon, and his belly seems to be enlarged on the left side. To these symptoms speedily succeed disinclination to move, weakness of the hind limbs, trembling of them, staggering, heaving of the flanks, protrusion of the head, redness of the eyes, heat of the mouth and ears and roots of the horns,

and a small but rapid pulse, generally varying from sixty to eighty beats in a minute. Rumination has now ceased, the appetite is lost; the feces are rarely voided, and are hard, and covered with a glazy mucus, and that mucus is sometimes streaked with blood; the animal also moans with intensity of pain.

"These symptoms rapidly increase; the patient becomes more depressed; the pulse more feeble; the moaning incessant, and the beast is continually down. He becomes half-unconscious, and is evidently half-blind; the mouth is filled with foam, and the tongue is covered with a brownish-yellow deposit. There is grinding of the teeth and difficulty in the swallowing of liquids; a tucked-up appearance of the belly, mingling with the enlargement of the left flank, and the whole of the belly is exceedingly tender. Until he is too weak to raise himself, he is exceedingly restless, lying down, and immediately getting up again, and with convulsive movements of the neck and extremities. The evacuation of the feces is entirely suppressed, or a little stream of liquid excrement forces a passage through the hardened mass by which the rectum is distended, and that which is voided has an exceedingly foetid and putrid smell. This symptom is characteristic. The person who is accustomed to cattle says, that the beast is *farfel-bound*, or *sapped*; but he often mistakes the nature of the case, and fancies that diarrhoea instead of costiveness exists. The urine becomes thick and oily and brown, and has a peculiarly disagreeable and penetrating smell. As the disease proceeds, the weakness and suffering increase, until the animal dies, sometimes exhausted, but mostly in convulsions, and frequently discharging a bloody foetid fluid from the mouth, the nose, and the anus.

"Sometimes when the disease has not been attacked with sufficient energy, and oftener in despite of the most skilful treatment, other symptoms appear. The animal seems to amend: the pulse is slower and more developed; rumination returns; the patient eats a little; the enlargement of the flanks subsides; the excrement, whether hard or fluid, is more abundantly discharged: but the beast is sadly thin; he is daily losing ground; his coat stares; his hair is easily detached; the skin clings to the bones: he is sometimes better, and sometimes worse, until violent inflammation again comes on, and he is speedily carried off."*

* Hartel d'Arboval, in his "Dictionary of Veterinary Medicine and Surgery," thus describes some of the symptoms in a more than usually

The terminations of enteritis are :

Resolution.—A gradual diminution of the symptoms, and return to health.

Ulceration.—Frequent purulent evacuations, with rapid emaciation ; and, finally, death.

Gangrene.—Sudden suspension of pain ; suppression of secretions ; cold, clammy condition of body ; gums and inside of the lips livid ; delirium, convulsions, and death.

Post-mortem Examination.—The appearances presented after death from enteritis are very striking. The external surface of the bowels exhibits various shades of inflammatory hue, from slight red to purple and black ; sometimes in patches, but more often diffused and frequently extending to the stomachs. The blood-vessels are engorged with dark blood. The mucous membrane lining the bowels is turgid and jelly-like in appearance, which condition is owing to the amount of submucous hæmorrhage and serous exudation, often rendering the intestine half an inch or more in thickness. Ulceration is occasionally present, particularly towards the rectum, which is often gangrenous.

Enteritis may assume a chronic form ; in such a case intermittent pains occur, the feces are alternately watery and hard, the abdomen is tense, and flatulency and vomiting are more or less frequent.

Treatment.—Stimulants and cordials should form no part of our treatment in this disease. Our first duty is, if possible, to ascertain the cause. Smart or brisk purgatives, as they are termed, are not usually advisable in enteritis. When, however, the illness can be traced to local irritation from the impaction of feces or foreign matters, or even intus-susception, a good dose of linseed oil or salad oil may be given at the onset with benefit. Drastic purgatives at any period of the disease are hurtful ; therefore, removal of the obstruction, if possible, by mechanical agents is decidedly

aggravated case : "The convulsive movements were exceedingly violent. The animal, seemingly afraid of everything around him, dragged himself along, and beat himself about in every direction, uttering the most frightful lowings. His tongue, red and swelled, hung from his mouth ; the nostrils were dilated ; the eyes haggard and full of tears ; all the mucous membranes were of a scarlet red ; the ears and horns were burning, as also was the whole surface of the body. The beatings of the heart were violent and rapid, yet the pulse was scarcely perceptible, and no blood could be obtained from the jugular."

preferable. Salad oil and linseed oil are valuable agents for this purpose; they effect their object by insinuation through the obstruction, supposing it to be ingesta or fecal matter; at the same time the oil shields the mucous membrane, and if there is intussusception, it facilitates its removal.

To relieve the pain, 1 to 2 drachms of opium in a pint of warm water, or, what is still better, barley water, should be given, and may be repeated in two hours if necessary. Opiate enemata can also be administered with the same view. Tobacco-smoke is recommended by some authorities for the same purposes. Counter-irritation to the abdomen is of great value: mustard embrocation, bags of hot salt continually renewed, or hot fomentations, may be used.

Bleeding is beneficial in the early stage only. The practice of draining the system nearly, of abstracting blood until the pulse falters, and then after a time having another turn—extinguishing the fire, as it is termed—preached by some of the old school, and practised by the hearers, has been found an unsound and unwarrantable doctrine.

Determination of blood to a part results in stagnation, or a gathering together of the corpuscles, and this is best relieved locally, and should be done before exudation takes place.

When the acute symptoms have subsided, the counter-irritation may be discontinued, but the abdomen must be kept thoroughly warm and the patient quiet.

With regard to support during the illness, bland mucilaginous drinks should form the only diet, and should be continued for some considerable time after recovery takes place, owing to the sensitive condition of the intestinal mucous membrane.

Finlay Dun says with regard to enteritis: "It is most serious amongst calves, in which it may prove fatal in three or four days. In older animals, a fatal issue does not occur so early; but unless amendment takes place in a week, the case is generally hopeless. A variety of enteritis affects the cow three or four days after calving, and involving the womb as well as the bowels, is difficult of treatment. The chief causes of enteritis in cattle are bad food, coarse wet pastures, irrigated meadows, bad water, and over-driving. Bleed early; give 1 pound of castor oil, 1 drachm of calomel, 3 ounces of laudanum, and 1 pound of treacle, beat up with 2 eggs, and about 2 pounds of warm water; repeat this

in half-doses every six hours; order clysters and hot fomentations to the belly; and if no benefit follows in two days, administer thrice daily $\frac{1}{2}$ drachm of calomel, 2 drachms of carbonate of ammonia, and 1 ounce of laudanum in gruel."

ENTERITIS EXUDATIVA ("ENTÉRITE COURNNEUSE" OF THE FRENCH; "CROUPARTIGE DARMENTZÜNDUNG" OF THE GERMAN).

Gamgee observes: "Under this name may be described a form of enteritis not uncommon amongst cattle, and which is characterized by the production of false membranes in the small intestine. It is sometimes acute, and at others chronic, commencing with symptoms similar to those of ordinary colic. Within a few days from the first symptoms there is diarrhoea, and the fluid fœtid feces contain shreds of lymph varying in length and thickness, but attaining sometimes the enormous dimension of twenty or thirty feet, and being often mistaken for worms. Usually after the discharge of these membranes, the animals improve. Delafond* describes the symptoms as those of irritative fever, associated with slight colicky symptoms, which last for twelve or fifteen hours. The mouth is hot; muzzle dry; conjunctiva injected; respiration short and convulsive; pulse small, frequent, and soft; the vertebral column is very sensitive; belly tense, tender, and often tympanitic; the feces, at first hard and dry, become liquid and glairy.

"These symptoms always increase in intensity until the fourth or fifth day, and so far the exudative enteritis differs in no respect from the simple inflammation of the intestine; but from the fifth to the sixth day, and rarely beyond the eighth in the exudative form, greyish false membranes are expelled, as already described. Recovery is generally prompt after such expulsion.

"Professor Lassaigue examined these membranes, and found that they were formed of a fibrino-albuminous matter, with mucous and alkaline or earthy salts.

"The cases of 'moulten grease,' described by old authors as observed in the horse and ox, are evidently cases of this singular affection. Indeed, I have seen shreds of loose, false membrane,

* "Receuil de Médecine Vétérinaire," 1842, p. 217.

discharged by the horse in cases of acute diarrhœa, and portions of such membrane have always been regarded as worms.

Treatment consists in an aloetic purge, or the use of sulphate of soda, sulphate of magnesia, or nitre, in doses of from 4 to 8 ounces, repeated twice daily of the first two, or doses of 1 ounce of the last at similar periods. Injections and sloppy gruel relieve and hasten convalescence."

GASTRO-ENTERITIS.

This is usually the result of irritant poisons.

Symptoms.—Those of gastritis and enteritis combined.

Treatment.—This must consist, at the onset, in removing the cause, followed by that laid down for the two diseases respectively.

Professor Simonds, in his lecture on this subject, observes:

"Cases of gastro-enteritis are very common both in calves and lambs. As existing in the calf, it is more frequently to be traced to the manner in which they are managed, than to the milk—such as buying them in to fatten, letting them suck morning and night, and giving them a little meal or oil-cake in the interval between. It may, however, arise from an altered condition of the milk. It also very frequently occurs in weaning, especially when weaned on the cow.

"I have known a farmer wean as many as ten calves on the same cow in a year, and many of them are attacked with scouring. A great deal depends on the manner the cows are fed, because we know that some kinds of food change the quality of the milk. For instance, if fed on mangolds the butter is white, if on turnips it impregnates the butter with the taste of turnip. And these facts show how easily the lacteal secretion is affected by the food; and it is a noted fact that if cows are fed on mangolds, and the milk is given to the calves, a number of cases of gastro-enteritis occur.

"Another cause is irregular feeding. The calf being kept longer from the cow than usual, there is a larger supply of milk for it; and the stomach being in a weakened state from long fasting, gastro-enteritis not unfrequently results.

"In suckling calves we should for the first three days and nights

allow them to be entirely with the cow, and afterwards put them to her every six hours ; then, in a day or two, increase the interval to eight, and perhaps after about ten days to twelve. And not, as most people do, directly the calf is born, take it away and only let it suck twice during the twenty-four hours ; it is both an unnatural and unwise plan. The same thing is not done with other animals ; their young are always allowed to be with them. These facts all show the importance of proper management.

"We observe with regard to the diarrhoea attendant upon these cases that it is white in colour and sour. The casein of the milk is coagulated by the gastric juice, and not being broken up easily, it acts as an irritant ; the whey runs into the intestinal canal, and so we get the evacuations little more than milk.

"Associated with this we have presented other symptoms. The animal wastes away, is tucked up, has a dejected appearance, a staring coat, and it moans and grinds the teeth.

"*Treatment.*—I do not agree with carminatives and astringents, but simply to neutralize the acid in the stomach by an alkali, as a drachm or drachm and a half of bicarbonate of potash in water, and withhold for a time the milk."

INTUS-SUSCEPTION.

When one portion of the intestinal tube "telescopes" or becomes invaginated within the portion anterior or posterior to it, what is termed intus-susception is established. Some authorities describe it as "twisted-gut," or gut-tie ; but these terms can only be associated properly with the condition known as strangulation."

Professor Simonds, in his lecture on this affection, observes :

"It is very difficult to diagnose a case of this kind, but as a general rule there are symptoms which may lead us to a fair supposition that intus-susception has taken place.

"In ordinary spasm there is very little alteration, while in intus-susception the pulse very soon becomes indistinct.

"The animal bears up a longer time in intus-susception than in ordinary inflammation. Before strangulation or intus-susception has taken place, the parts are perfectly normal. In spasm, there is a great tendency for the inflammation to extend, involving the

peritoneum and giving rise to peritonitis. Beyond these points there is very little else to rely upon. We do sometimes find the ox will recover, if only a small portion, as an inch or two, of the intestine is invaginated. So that in protracted cases we must not despair, as adhesion may take place between the inserted piece and the part it is inserted into, and the inner portion pass off by the rectum."

A case of this malady is recorded as far back as 1820 by Mr. Cartwright of Whitchurch. Youatt also mentions one which he says was a still more extraordinary and decisive case. "It was an old and rather over-worked ox. The beast had performed its task well three days before. That day was cold and wet, but the animal fed as usual on his return, and there was no indication of illness. On the following morning, however, there were evident symptoms of colic; the ox was in great agony. Anti-spasmodics, stimulants, and purgatives were freely administered, and twelve pounds of blood were abstracted. The animal at length obtained some relief; he lay down; he occasionally looked at his right flank; he struck it with his horn; he moaned; but there was not so much expression of intense agony. The bowels were obstinately costive, although 4 pounds of Epsom salts had been given, and a drachm of the farina of the croton nuts, and numerous injections had been administered. At length, purging came on, and was exceedingly violent. The beast then got up; it staggered listlessly along; it now and then looked at its side; it began at long intervals and half-unconsciously to ruminate; and it drank some gruel. On the second day of the purging, the animal strained considerably, and a black substance was observed to protrude and hang from the anus. It was evidently a portion of intestine. There had been intro-susception, and this was the involved part, which had become gangrenous, and had separated and passed away.

"It was sometime before the ox fully recovered his usual health and appetite, but he was sent to the market, six months afterwards, in fair condition."

Where suspicion exists of intus-susception, large doses of linseed or salad oil, with abundant mucilaginous drinks, would form the safest and most effectual treatment. Opium might be used to alleviate pain. Drastic purgatives and stimulants are strongly

contra-indicated. Or its removal might be mechanically effected by rolling the beast over on its back, and moving it quickly about—*i.e.*, in the early stage, before the commencement of adhesion.

STRANGULATION.

This condition of intestine may arise from various causes, and in certain districts is very common.

Yonatt states: "It is not of unfrequent occurrence in some districts, and especially in wet and marshy situations; it is peculiar to the ox, and is rarely observed in him after the second or third year.

"*Symptoms.*—The beast shows disinclination to food; rumination is suspended, or performed in a listless, interrupted manner; the animal appears to be griped—he strikes at his belly with his hind-legs, he lies down, and, as he gets up again, bows his back in an extraordinary way, and then, all at once stretching out every limb, he gives the spinal column a somewhat concave form. Small quantities of fieces are voided, mingled with mucous, and sometimes with blood; and if the animal is examined by introducing the hand into the rectum, he evidently suffers extreme pain.

"By degrees the ailment is referable to one side more than the other, and generally to the left side. The hind-leg on that side is frequently advanced and then retracted, and in some cases becomes partially paralyzed.

"These symptoms are more and more alarming. If the ox can be induced to eat, the griping pains are immediately increased; the belly swells; the countenance becomes anxious; the ears, the horns, the nose, and the thighs become cold; the pulse is small and accelerated, and scarcely to be felt; the breathing is laborious and hard at a distance; the mouth and nostrils are pale. The disease continues during six, seven, or eight days. It yields to no medicine; it is aggravated by most of the measures adopted—it is especially so if the beast is moved about; and at length death terminates the period of suffering.

"On examination, strangulation of some part of the intestine is found, and generally of the small intestine. It is tied by a distinct and evident cord: in some cases it is the spermatic cord, which, after castration unskillfully performed, or now and then by mere

accident, has been retracted into the belly, and has become enlarged, and has had tumours forming on it, and particularly at its extremity. Oftener it is an adventitious or unnaturally formed membrane, which becomes entangled round the intestine and assumes the appearance of a cord.

"The mode of operation in castrating bullocks is often very absurd. Some practitioners pride themselves on performing it with scarcely the loss of any blood. They open the scrotum, and lay bare the spermatic cord, and then, by mere dint of pulling and twisting, they tear it out. There is certainly no bleeding, and the portion that remains immediately retracts into the belly; but the consequence of all this violence is that inflammation ensues, tumours, false membranes are formed, and the foundation is laid for this complaint. Others draw the cord out as far as they can without tearing it, and then cut it off close to the pelvis. There is no external bleeding in this case; but there is bleeding within the cavity of the belly, and a source of irritation is set up by the presence of this blood, and various abdominal diseases ensue, and among the rest the *corde* or *gut-tie*."

Treatment.—Professor Simonds, in his lecture on this subject, observes: "The animal bears up a long time under this condition hence people have operated successfully on the third or fourth day, while if sphacelus had been present they could not have done so. With regard to the operation, there are a great many opinions as to the side it should be done on, many advising the left. It should, however, be done on the right side, opposite to the spot on the left where we puncture for hoven. When the incision has been made, the cord that is tying the intestine will most likely be seen. We must then draw it to the mouth of the wound, cut it, and then allow it to recede; stitch the external wound up in the usual manner, and apply a bandage with cold-water dressings, and the operation is finished; while, in operating on the left side, we have the rumen in our way, and also have to grope about among the intestines. With regard to the after-treatment, it should be left to nature. Avoid stimulants or cathartics, or anything which will increase the peristaltic action of the intestines. We may use tepid enemata to assist in bringing away the *fæculent* matter.

The diet should be in liquid forms, as we have to guard against thirst and not hunger—as tepid water, gruel, or boiled oil-cake, for

four or five days. "If the animal appears to be suffering great pain after the operation, there will be no objection to the administration of a watery solution of opium; and if a purgative is required, it should be oil."

Gamgee observes: "This interesting lesion occurs in certain districts, and especially in countries where oxen are worked in the plough. It has been erroneously considered as a ligature of the intestine by the spermatic cord, which is left long in castrating by pulling out the testicle after an incision in the scrotum.

"The nature of the lesion has been well described by the German veterinarians. It consists in protrusion of intestine through a laceration of the peritoneum into a cul-de-sac between the remnant of the spermatic cord and the margin of the pelvis. It is indicated by severe abdominal pain, and is recognised at once by the practitioners, who often meet with cases in the districts where it is observed.

"*Treatment.*—It is possible to have a spontaneous cure by turning the animal sharply on its back, or suddenly elevating its hind-quarters by causing it to leap off a step. If this fail, the hand must be passed up the rectum, and reduction effected by pushing with the palm upwards and forwards, so as to lift the imprisoned fold through the opening." In cases that resist this method he advises the operation by Professor Simonds already alluded to.

STRICTURE AND FATTY DEGENERATION OF THE RECTUM.

An interesting case of the above description occurred in my own practice, and was recorded in the *Veterinary Journal* as follows:

On June 2nd I received a message to proceed to Endon, the seat of J. Pritchard, Esq., to examine a fat heifer which was being got up for show, and which had lately taken to "straining;" at the same time "her bowels were open, and when straining a bloody discharge came away." Proceeding to Endon the same day, I found the heifer, a three-year-old Hereford, apparently in perfect health, but every few minutes she strained and passed a small quantity of feculent matter of a normal character. She was enormously fat, so much so that the anus and vulva were scarcely per-

ceptible. I suggested an examination *per rectum*, and immediately carried it out. I was able to introduce my hand about 12 inches, when I found the passage suddenly constricted to such an extent that I could scarcely pass two fingers. This confirmed, to some extent, the opinion I had given, that probably the bowel was "growing up," which the veterinary surgeon who had previously attended assured him was not so. Such being the case, the bailiff thought it better not to run the risk of keeping her till Christmas, he having had a similar case before; but until some decision was arrived at I prescribed chlorodyne mixture to allay the straining, and ordered a pint of linseed oil to be given three times a week, as well as laxative food, strictly prohibiting anything in the way of diet which had a constipating tendency. On June 6th I saw the animal again, and her condition was much the same. I was told a butcher had been communicated with. On the 12th I saw her slaughtered, and on examination the parts affected presented a most unusual appearance. I have forwarded 40 inches of the bowel adjoining the anus. You will observe that the whole of it is surrounded by an immense layer of solid fat, and between this and the intestine is a dense grey substance $\frac{1}{8}$ inch in thickness, running the entire length. The stricture commences 12 inches from the anus, and for 36 inches is continued, in one or two places scarcely admitting the little finger. The mucous membrane is inflamed, more so in some parts than in others. The mass of bowel sent weighs 20 pounds. Whether it is a case of fatty degeneration, fibrous stricture, or cancer, you will be able to determine. I am at present inclined to believe it is the two former combined, but three medical men lean to the latter. I have since learned that the heifer had been home-fed since she was a calf, and that her age was about three years when she was slaughtered; she had never been unwell before, but her grandsire died about four years ago from the same morbid condition.

(Dr. Thin made a careful microscopical examination of two small portions of the morbid specimen above alluded to, and reports that the mass between the peritoneal and muscular coats of the bowel is simply fat; the muscular layer, mucosa, and epithelium being healthy. He adds: "I suppose it is correct to speak of such a mass as a 'tumour,' although it was not encapsulated. It is certainly safe to call it 'growth.'")

From the fact of a near relative of this beast being affected in precisely the same way, it would appear there was an hereditary tendency to this disease.

PROTRUSION OF THE RECTUM.

This condition is occasionally met with in the ox, and usually results from violent straining, as in the case of diarrhoea, dysentery, parturition, or mechanical injuries. It also occurs from paralysis, and is seen in the comatose stage of parturient apoplexy. The protruded intestine is from its congested and strangulated state, owing to the powerful contraction of the sphincter muscle, very red, and unless speedily returned, becomes nearly black and gangrenous. So long as the inversion remains the animal persistently strains, and considerable constitutional disturbance takes place.

Treatment.—The protruded intestine should be first cleansed with tepid water, or milk and water, of any dirt or foreign matter which may be clinging to it. Then being well oiled, efforts not too forcible should be made to return it to its proper position. When this has been accomplished the rectum should be plugged for a few hours with cold-water swabs or a large sponge, and means taken to retain them there, either by a suture across the anus or the proper application of a truss.

A severe case, with extensive lacerations, recently treated by the author as above, did well; the swabs and sponge were removed the following morning.

It is advisable in the generality of cases to give an oleaginous aperient, and the diet should be sloppy and of a laxative character.

In cases of recurring or continued inversion excision of the protruded intestine has been recommended; and in the ox this seemingly formidable operation can be performed with greater impunity than perhaps in any other of the lower animals.

"There will probably be considerable hæmorrhage, but the practitioner must not be alarmed at that; it will be beneficial rather than injurious; it will prevent or abate inflammation, and it will cease long before the strength of the patient is exhausted. The little portion of intestine half-protruding at the anus will gradually return; the sphincter muscle will contract; union of the divided

portion of the intestine will take place, and the animal will perfectly recover."—*Youatt*.

"If the sufferings of the animal be not very great it is generally advisable to allow a short time to elapse before removing the sphacelated mass, in order that new adhesions may form; but if the animal suffers severely it is advisable to insert sutures for the purpose of causing union between the gut and anal-opening, and at once remove the whole protruded mass with a sharp bistoury, the subsequent pain and straining being alleviated by a full dose of opium."—*Williams*.

ANTHRACOID TUMOURS IN THE RECTUM

"In addition to the ordinary symptoms of anthrax fever, the fæces, usually dry and hard, are mingled with black, tar-like viscid blood, and tenesmus is constant during their expulsion.

"The mucous membrane of the rectum is at the same time very hot and swollen.

"Death may occur very rapidly—within a few hours, or not until after some days.*

"*Treatment*.—Anthracoid tumours in the rectum should be treated by cold, slightly-acidulated enemata, and cold-water douches to the spine. The rectum should not be evacuated by the hand as there is great danger of infection. The other parts of the treatment are similar to those for anthrax in general." (See "Anthrax.")

IMPERFORATE ANUS.

An absence of the anal-opening is occasionally met with in the bovine species, and, of course, can only be dealt with at the time of birth, when the operation should immediately be performed. For a detailed account of this condition, its symptoms, and treatment, see "Diseases and Abnormalities of the Young Animal."

* Röll mentions that certain authorities have classed among anthracoid diseases a rare bovine malady (*Sterzwurm*) which is characterized by ulcers on the tail, and which extends to the ligaments of the coccygeal bones, causing the loss of a portion of the organ. It is treated by ablation of the tail above the diseased part, and cauterization of the wound.

FISTULA IN THE ANUS.

This affection is rarely witnessed in the ox, and, as in other animals, is usually due to injury. The fistula may be external or internal, complete or partial, *i.e.*, external if the orifice of the wound is in the integument, or internal if within the rectum; complete if the two orifices exist together; partial when there is but one orifice.

Symptoms.—If the fistula is external it requires little diagnosis—more or less irritation of the part is always manifested; if internal, and not complete, there is an offensive rectal discharge, and the *feces* are often coated with pus and blood.

Treatment.—This consists in freely laying open the sinus with a probe-pointed bistoury, and treating it first as a common wound, and subsequently with a solution of chloride of zinc. If considerable hæmorrhage follows, the part should be packed with lint, cotton-wool, or tow steeped in tinct. of iron, or a solution of tannic acid; or if it result from a divided artery, the vessel should be tied, if possible. Strict attention should be paid to the bowels, and at no time should constipation be allowed to take place. When the danger of hæmorrhage has passed, warm-water injections may be used with benefit both as an enema and a detergent.

PILES.

This condition of the anus, which consists of irritating and painful tumours around its verge or within the sphincter muscle, is sometimes met with in the ox. It may be termed an abnormal distension of the hæmorrhoidal veins; hence the term hæmorrhoids, or piles. These veins, which are large and tortuous, form a plexus around the terminal portion of the rectum. The majority of them lie under the mucous membrane within, the minority under the skin around and external to, the sphincter. Piles, therefore, may be external or internal, or the two may co-exist.

Symptoms.—Accompanied with their appearance if externally, or knowledge of their presence internally by examination, there is general uneasiness. The animal evinces rectal irritation by rubbing

the part, if possible, whisking the tail, and continually moving the hind-legs, which are sometimes observed to be stiff. There is also, especially if the piles are internal, frequent straining, and the *faeces* in the latter are often coated with blood, and the hand, if passed into the rectum, is similarly stained. Occasionally the bowel is prolapsed, and is then observed to be highly injected—indeed, generally livid. When the piles are inverted with the prolapsus, they present the appearance of irregular nodules *en masse*, of a bright scarlet, crimson, or livid hue; while those externally placed not unfrequently resemble black grapes, to which they have been compared.

Constitutional disturbance, always more or less present, is denoted by loss of appetite, suspended rumination, diminished lacteal secretion, a hard frequent pulse, injected mucous membranes, increased breathing, moaning, and grinding the teeth.

Results.—Inflammation, suppuration, hæmorrhage, ulceration, fistula, mortification, and sloughing.

Treatment.—This must be both constitutional and local; at the same time, we must bear in mind the importance of preventive measures. The constitutional treatment consists in relieving the plethoric and congested condition of the portal circulation, and stimulating the secretion of bile. Aloes and calomel combined with salines are most serviceable in the ox, followed by mineral acids; opiates combined with oil may be advantageously given where excessive straining and pain exists. From the nature of the affection it is hardly necessary to remark that constipation should always be avoided. The food should be light, easily digestible, and of a non-stimulating nature.

The local treatment may be of an alleviative nature or curative. The former comprises cold applications, astringents, or sedatives; the latter, operative measures. The removal of external piles may be accomplished by excision, ligature, or cauterization; the last-named is more advisable in internal piles.

The preventive measures lie in an avoidance of the causes, in promoting a healthy condition of the digestive organs, and maintaining the vigour of the animal by natural rather than artificial means.

HERNIA.

Hernia signifies here a protrusion of intestine from its normal cavity. The forms usually met with in cattle practice are *inguinal*, *scrotal*, *ventral*, *umbilical*, and *diaphragmatic*.

Inguinal hernia consists of the passage of a portion of intestine into the inguinal canal through the internal abdominal ring.

Scrotal hernia is established when the intestine passes through the external abdominal ring into the scrotum.

Ventral hernia signifies rupture of the abdominal walls in any portion of its parietes except the navel, and protrusion of intestine through the opening.

Umbilical hernia is protrusion of intestine through the navel aperture.

Diaphragmatic hernia (the most dangerous form) exists when any of the abdominal viscera pass through the diaphragm into the thoracic cavity.

Various descriptions of hernia exist, being usually spoken of as *congenital*, *complete* and *incomplete*, *reducible*, *irreducible*, *incarcerated*, and *strangulated*.

Congenital hernia is that form usually observed at the umbilicus, and may be seen immediately the animal is born. The tumour varies in size according to the size of abdominal opening, the position of the creature, and the distension of the stomachs and alimentary tract. It is usually soft, fluctuating, and easily depressible.

Complete and incomplete hernia relate to the stage of the protrusion.

Reducible hernia denotes an easily returnable condition of the enlargement, which is usually soft and compressible, varies in size according to circumstances, and reappears after temporary reduction.

Irreducible hernia signifies the impossibility, by ordinary manipulation, of complete reduction. Other parts are involved in the protrusion, as the omentum and mesentery; and the sac is usually large, and contains a considerable mass of structure, with frequently (if it has existed some time) contraction at the neck of the sac, and adhesions.

Incarcerated hernia constitutes an irreducible hernia, interfering with the faecal passage through the protruded intestine, but without strangulation or impeded circulation.

Strangulated hernia is that condition where the protruded viscera are so constricted that the passage of faeces is prevented, and the circulation also obstructed.

For the treatment of hernia, see Chapter on "Accidents and Operations."

PERITONITIS.

Inflammation of the peritoneal or serous membrane lining the abdominal cavity and covering its viscera is not a common disease in the ox.

Causes.—External violence, as kicks, blows, wounds (particularly punctured), parturition, hernia, prolonged constipation, exposure to damp and cold. It may also be produced as a secondary disease by hepatitis, splenitis, nephritis, enteritis, and tuberculosis.

Symptoms.—Acute peritonitis is characterized by abdominal pain, which is considerably augmented by pressure. The belly is more or less tense, and tucked up; the animal is disinclined to move, but exhibits its uneasiness by continually twisting the tail, and occasionally picking up one hind-leg and then the other. The breathing is hurried, and the expirations hot, and the pulse hard, quick, and wiry; conjunctival membranes injected, muzzle dry and hot, the buccal membrane slimy; the urine is scanty and high-coloured, and constipation is usually present throughout.

As the disease advances, the tenseness of the belly increases, and the pain becomes very great; the animal moans, grates the teeth, the extremities are cold, and finally coma or delirium sets in, and death speedily follows.

Post-mortem Appearances.—Intense inflammation of the peritoneal membrane, often extending through its whole thickness, and portions of it are not infrequently found to be gangrenous. The membrane covering the intestines is frequently involved; livid and streaky patches are also to be observed on that portion of it covering the stomach and liver. The abdominal cavity contains more or less serous fluid, with often large exudations of lymph; if

the disease has existed some length of time, the serous effusion is very considerable, of a sanguineous hue, and smells exceedingly offensive. When the lymph exudation surrounds and attaches the intestines, death invariably results.

Treatment.—In the early stages of acute peritonitis, the bowels may be moved by an oleaginous aperient; but in the later stages—when, in all probability, the membrane covering the intestines is involved, adhesions taken place, and large effusion of serum, and the system is consequently unable to stand depletion—purgatives are attended with great danger, and simple enemas alone should be relied upon. A soothing system of treatment is from first to last indicated. Fleming's tincture of aconite, 10 to 15 minims, may be given every three hours in a little water; or chloroform and opium, of each 1 to 2 drachms, in the same way. Chlorodyne also is often an excellent medicine, 4 drachms in water or thin gruel every four hours.

Hot fomentations with rugs should constitute the local treatment. This continually persisted in is much more serviceable than the application of stimulating embrocations or mustard.

Sedative enemas may also be used, and are attended for a time with much relief.

The diet as for enteritis should be adopted.

Acute Peritonitis may terminate in recovery, ascites, or become chronic.

Chronic Peritonitis is generally the result of an acute attack.

Symptoms.—These are not so easily defined as in the previous form. The abdomen is hard, enlarged, and somewhat contracted at the sides. Uneasiness, or a kind of subacute pain, appears frequently to be present, especially after feeding. There is also a degree of fever continually present, the muzzle is seldom bedewed, and the pulse is low and fluctuating. The animal becomes gradually emaciated, the abdomen increases in size (vulgarly termed pot-bellied), the appetite fails, and death from exhaustion takes place. This form of peritonitis is generally associated with ascites.

Post-mortem Examination reveals a thickened condition of the peritoneal membrane, with frequently numerous granulations on

its abdominal surface. The serous effusion is more abundant, and of a paler or more limpid colour than in acute peritonitis.

Treatment.—This consists in tonics and absorbents. The iodide of iron and potassium is exceedingly advantageous; if the debility is extreme, brandy and cod-liver oil may be given. An easily assimilated and nutritious diet should be allowed, with pure air and moderate exercise.

CHAPTER VIII.

DISEASES OF THE LIVER AND SPLEEN.

Congestion of the Liver.—Inflammation of the Liver.—Jaundice.—Gall Stones.—Splenic Apoplexy.—Splenic Fever.

CONGESTION OF THE LIVER.

THE ox, though not so frequently the subject of hepatic affections as the horse, sheep, and dog, is nevertheless, I believe, more often

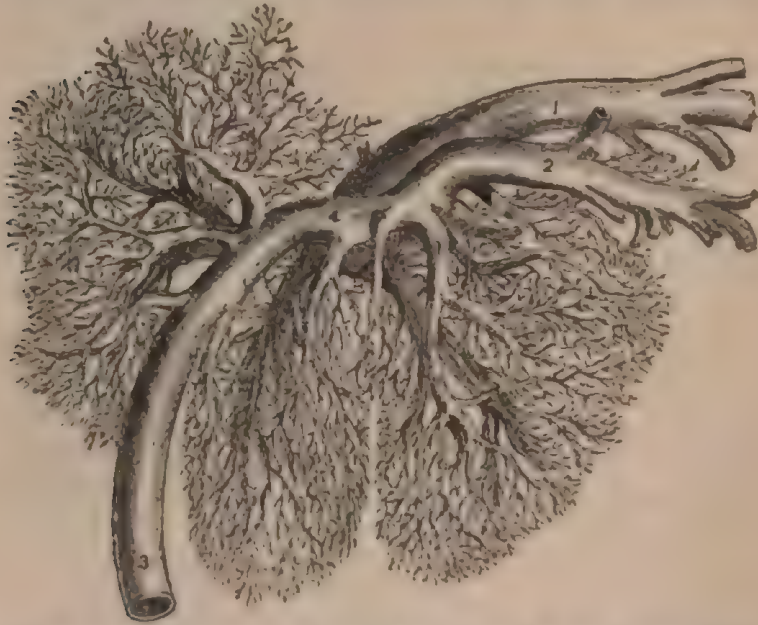


Fig. 45.—Blood-vessels in the Liver of an Equine Fetus at Mid-Term. 1, Umbilical Vein. 2, Its Anastomoses with the Portal Vein. 3, 4, Ductus Venosus. 5, Posterior Vena Cava.—*Colin*.

affected in the liver than is suspected, and a congested state of it is far from unusual. Indeed, looking at this organ anatomically, at

the immense distribution of bloodvessels through it (Figs. 45, 46), we cannot be surprised at such a condition taking place; in fact, rather that it should not occur more frequently in so vascular an organ.

Causes.—Sudden changes of temperature, excessive heat, fatigue, over-feeding, stimulating food, obstruction of bile, parasites (flukes) in the hepatic ducts, are severally productive of congestion of the liver. It is also often associated with epizootic diseases, and frequently co-exists with *traumatic pericarditis*. "In heart diseases there is stagnation of blood in the vena cava and hepatic veins; in time, as explained by Frerichs, this is propagated to the portal vein, and to the organs from which it takes its origin; the liver then



Fig. 46.—Section of Liver with Hepatic Veins Injected.—*Kiernan*.

becomes turgid with blood, and the congestion extends to all the veins of the digestive system. In the same manner consolidation of the lungs, by arresting the circulation of the blood, causes congestion of the liver and enteric veins, and is one cause of the diarrhoea which is so often an accompaniment."—*Williams*.

Symptoms.—Congestion of the liver in the ox is usually marked by general depression, occasionally a jaundiced condition of the visible mucous membrane, a low pulse, constipation, frequent tympany, high-coloured urine, and defective or variable appetite. Sometimes there is bulging over the region of the liver, attended with soreness, and the animal looks round towards that side.

Treatment.—Considering the engorged state of the gland, and its liability, as also that of its capsule, to rupture, the practitioner

is fully justified in abstracting blood—"such a quantity of blood as the character and nature of the pulse will warrant; so long as the artery is round, the pulsation distinct—no matter how severe the seeming dejection and debility may be—a free abstraction of blood will be succeeded by amelioration of the symptoms, as they are but consequences of the state of hyperæmia, the removal of which is of paramount importance."

"With regard to medicine, cathartics, followed by neutral salts, as the sulphate of magnesia, cause a drain from the portal system, and thus relieve the congestion."—*Williams.*

Counter-irritation on the right side over the region of the liver is also useful.

Congestion arising from superfluous bile, from obstruction, or parasites in the ducts, is best treated with mild saline aperients and light unstimulating diet. "The administration of the so-called liver stimulants, as calomel, is contra-indicated, for the reason that the secretory powers of the gland are not interfered with, but that it is incapable of discharging the secreted bile, owing to the tumidity or swollen condition of the lining membrane of the small bile-ducts."—*Williams.*

INFLAMMATION OF THE LIVER (HEPATITIS).

Inflammation of the liver is of far more serious import than the former, of which it is frequently the result.

Predisposing Causes.—Over-feeding, rich and stimulating diet.

Exciting Causes.—Congestion, intense heat, biliary concretions, external violence, as blows, kicks, crushing, etc.

Symptoms.—Acute pain over the hepatic region, which is considerably increased by pressure. Frequently the animal gazes towards the seat of disease and moans; the breathing is short and accompanied by grunts; the pulse is hard and quick; the visible mucous membranes are injected; rigors are frequent, and the ears and horns are hot.

As the inflammatory action proceeds, the pain increases, the animal shrinks from approach on the affected side. The mucous membranes become sometimes yellow, the same tinge being observed on the thin parts of the integument. The urine is also high-coloured, and the milk not unfrequently has a yellow cast.

The dung is hard, dry, and usually light in colour, or of a clay appearance. The abdomen looks tympanitic, and there is frequently to be observed considerable enlargement or bulging in the hepatic region. The horns and ears now become cold, the eyes dull and sunk, the nose dry and breath fetid, the coat is harsh and staring, rumination (almost from the first) ceases, the appetite is lost, and, the sufferer rapidly falls into an emaciated condition.

Terminations.—Acute hepatitis may terminate in resolution, abscess, or become chronic.

Treatment.—Strong counter-irritation over the region of the liver and administration of saline aperients are the measures first indicated. When the acute symptoms have subsided, small doses of calomel, 10 to 15 grains, may be given every other day until a beneficial effect is observed. If this fails after three or four doses, a drachm of dilute nitric acid twice daily will be sometimes attended with benefit; stimulants should never be administered. Bleeding is uncertain, but now and again appears to do good.

The food should be of the plainest character and easily digestible, as mashes, gruel, linseed, etc.

Abscess, or Suppurative Inflammation of the Liver is rarely diagnosed in the ox. The fever in such cases is very considerable; the limbs are often cedematous and the abdomen large and pendent; the pulse is small and feeble; bilious diarrhoea is frequently present. More or less pain is manifested in the hepatic region, which is aggravated by pressure, and there is a disinclination to lie on the right side.

Treatment is useless.

Chronic Hepatitis is usually marked by a variable appetite, flatulence, constipation, turbid high-coloured urine, depression and inactivity; the visible mucous membranes are yellow, the coat is staring, the skin tight; and such an animal has what may be termed an unthrifty appearance. The liver may be enlarged or otherwise; it is usually the former, being hard and more or less insensible to pain on pressure, ascites is not unfrequently present.

Treatment.—This consists in measures calculated to restore as far as possible the functions of the disordered organ. Saline aperients may be given with advantage, followed by the iodide of potassium. Hepatic tenderness indicates the employment of

counter-irritation. The diet should be light, digestible, and of a laxative nature.

"*Inflammation of the Capsule of the Liver (Perihepatitis)* and of Glisson's capsule is rarely accompanied by serious derangements, unless the inflammation extends to the portal or hepatic veins, or causes obstruction of the larger bile-ducts—events of rare occurrence."—*Frerichs*.

"Peritonitis, disease of the liver itself, or inflammation of the neighbouring structures, such as pleurisy, are the usual causes of perihepatitis. The chief symptoms are tenderness of the hepatic region on pressure, motion, or deep inspiration, without any change in the volume or situation of the organs.

"Jaundice, as a rule, is absent; so also are febrile phenomena."—*Aitken*.

The following interesting case of interstitial hepatitis, complicated with other disease, is recorded in the *Veterinary Journal*, December, 1878, by Professor Walley:

INTERSTITIAL HEPATITIS AND BILATERAL NEPHRITIS (HYPERTROPHY)
AS THE RESULT OF AN ENORMOUS THROMBUS IN THE THORACIC
POSTERIOR VENA CAVA OF A COW.

Subject: a very old cow, probably fourteen years, cross-bred, purchased by a dairyman in the end of May, 1878. On the 10th of June purchaser sought my advice, stating that he had a cow with 'red-water,' that she had not been well during the whole time she had been in his possession; that she was purging, and that the urine had been red for several days.

"From his description I concluded that it was a case of 'red-water,' and as he had given a strong cathartic, I simply gave him two doses of ol. tereb. et spts. aeth. nit. As she appeared to be no better on the 12th, after having the medicine, the owner desired me to see her.

"Symptoms presented were anæmia, emaciation, hide-bound, harsh coat, suppression of lactation, dysorexia, partial suspension of rumination, pulse slow, respiration and temperature normal, diarrhoea, marked general icterus, absence of physical lung symptoms, weak action of heart.

"Saw her both morning and evening, and while examining her

in the evening she urinated. The first portion of urine was clear; towards the close the lower part of the stream became discoloured by admixture with red corpuscles; no clots.

"On rectal exploration I discovered great enlargement of the left kidney (I could not reach the right); slight pain on palpitation over the left lumbar region.

"*Diagnosis.*—Chronic disease and hypertrophy of left kidney, with chronic disease of liver. Contented myself with administering ferri perchloride daily, and ordered linseed mash; advising the proprietor to discover the former owner, send him my certificate, and hold him responsible; giving him the opportunity of sending a professional man to see the cow, or come personally.

"He adopted this advice, and on the 20th received a communication from the vendor, repudiating all knowledge of disease, denying responsibility, and stating that two veterinary surgeons had seen her immediately before the sale, and were ready to swear she was in perfect health.

"I saw her on the 14th, and again on the night of the 21st, when my opinion being the same as on the 12th—the animal rapidly emaciating, while the pulse was only forty, and the heart's action weak—the owner determined on slaughtering her. I saw her again on the 22nd, a short time before slaughter at the abbatoir, immediately she was brought in, when, from the excitement, she coughed irritably. (I had detected what appeared to me to be a thrombus, about the size of my little finger, in the left jugular fossa, on the previous evening.) Reasoning as to what could be the cause of the cough (seeing that there was no sign of lung disorder), and taking into consideration the condition of the heart and pulse, I came to the conclusion that there was some form of chronic heart disease, in addition to the renal and hepatic disorder. I directed the attention of the inspector to the local authority (Mr. Reid, V.S.) to the cow, and asked him to examine her carefully, and superintend the post-mortem examination, as I could not remain.

"About 8.30 p.m. I went to the abbatoir and removed both kidneys from the carcass. I found them the seat of chronic interstitial inflammation, and enormously hypertrophied and scirrhus; the left was the larger, and contained in its pelvis a quantity of bloody fluid (none was in the right); the renal veins were enor-

mously dilated, and the coats thickened. The liver was in the same condition as the kidneys: nodulated on the surface, dark in colour. The posterior vena cava, as it passed through the diaphragm, was twice its normal diameter, and four or five times its normal thickness. The gall-bladder contained a moderate quantity of bile of a very pale colour—due to the absence of bile-pigment. The lungs were healthy. The heart was also healthy, but small, and weighed only five pounds. The thoracic posterior vena cava contained an enormous thrombus, which was solid, unyielding, decolourised, and smallest and somewhat conical on its proximal end, obliquely truncated, smooth and round-edged on its distal extremity—which was also darker in colour than the proximal. It was intimately connected with the tunica intima by numerous bands of firm, white new connective tissue. The coats of the vein were at one part as thin as tissue-paper, but intact. The thrombus measured $9\frac{1}{2}$ inches in length and $10\frac{1}{2}$ inches in circumference.

"Weight of liver, $35\frac{1}{2}$ lb.; left kidney, $8\frac{1}{2}$ lb.; right ditto, $7\frac{1}{2}$ lb. = $51\frac{1}{2}$ lb.

"*Conclusions.*—The thrombus had probably originated in some injury to the tunica intima of the vein, and had gradually increased in size—this being the more probable as it was so intimately connected by fibrous bands to the vein, these bands being the result of phlebitis and organization of fibrine. A channel existed on one side of the thrombus capable of admitting about three little fingers laid side by side—thus allowing the blood to flow slowly through.

"The obstruction in the vein (which must have been in existence for quite twelve months) had caused regurgitation of blood into the liver and kidneys, and thus produced mechanical congestion, followed by interstitial inflammation, hypertrophy, and scirrhus. The diarrhœa was produced by the absence of bile.

"The absence of any organic disease of the heart and lungs is accounted for by the obstruction being located posteriorly to them, and occurring in a vein, and by the fact that no secondary or prolonged thrombus had been formed to block up the pulmonary vessels.

"The shape of the distal extremity was caused by the oblique position of the foramen dextrum of the diaphragm, and this also

accounted for the fact that there was no secondary remaining thrombus on this extremity. The absence of soft thrombus on the proximal extremity was accounted for by the fact that the stream of blood from the anterior cava would prevent its formation by washing away even the smallest attempt at a coagulum.

"On making a longitudinal section of the thrombus and the vein, it was discovered that it was really composed of two about equal parts intimately connected; coagulation having commenced at two points, and gone on in layers, forming what might be spoken of as two stratified hamatomata, the centre of the posterior one having commenced to soften by the action of a large transverse ring of vascular granulating tissue; while the floor of the anterior part had also commenced to soften from a circumscribed granulation. These granulating centres had evidently resulted from phlebitis, the original roughenings of the tunica intima acting as starting-points for the formation of the clots. Both clots were perfectly decolourized throughout."

JAUNDICE (ICTERUS).

This is a disease to which the bovine tribe is very prone. Jaundice may be associated with other maladies (but of which it is more often the sequel), or exist independently.

Causes.—Suppression or retention of bile, more particularly the latter, which becomes reabsorbed into the system;* biliary calculi in the gall-bladder or its duct, inspissated bile, disease of the liver, as inflammation, enlargement, contraction, scirrhus tumours, abscess; immoderate use of purgatives, especially aloes and calomel; sudden chills after heat and fatigue, accumulation of feces. "It

* "There can be no doubt that when the bile, after being formed in the liver, is detained there, or in the gall-bladder, in consequence of some impediment to its excretion, it is reabsorbed, both by the lymphatic vessels and by the veins, carried into the circulation, and so conveyed to the surface, and to the parts in which the change of colour is observed."—*Sir Thomas Watson's Lectures.*

may also be produced artificially by ligaturing the hepatic duct, which proves that obstruction of the flow of bile into the intestine can cause the disease* (*Williams*). Over-feeding with rich and stimulating food, and the use of heating condition-powders, has been set down as a cause of jaundice. Cows are also said to be particularly subject to it in spring and autumn.

The two forms of the disease as arising from suppression or non-elimination, and from reabsorption of bile, "are distinguished by the presence of the biliary acids in the urine when it arises from reabsorption, and their absence when due to suppressed secretion. The test is as follows: To a couple of drachms of the suspected urine add a small fragment of loaf-sugar, and afterwards pour slowly into the test-tube about 1 drachm of strong sulphuric acid. This should be done so as not to mix the two liquids. If biliary acids be present, there will be observed at the line of contact of the acids and urine, after standing for a few minutes, a deep purple hue. This result may be taken as a sure indication that the jaundice is due to obstructed bile-ducts. On the other hand, the absence of this phenomenon, and the occurrence of merely a brown instead of a purple tint, although in the earlier stages of jaundice equally indicative of suppression, is no indication of the cause of the suppression, which must be gleaned from other circumstances (*Harley* on 'Jaundice'). Non-secretion of bile may arise from a variety of causes: 1st, innervation; 2nd, disordered hepatic circulation; 3rd, absence of secreting structure, as in atrophy, the invasion of tubercle, and the degenerations.

"Jaundice from reabsorption is arranged as follows: 1st, obstruction by foreign bodies within the bile-duct; 2nd, obstruction by

* "In the beginning of the present century, Dr. Saunders, of Guy's Hospital, made on this subject some conclusive experiments, which have since been repeated by others with similar results. The hepatic duct of a dog having been tied, and the animal killed two hours afterwards, the numerous lymphatics in the walls of the bile-ducts were seen to be distended with a yellow fluid; the fluid in the thoracic duct also was yellow; and so were the intervening lymphatic glands. Again, two hours after the ligation of the hepatic duct, the serum of the blood taken from the hepatic vein was found to contain much more of the colouring matter of the bile than that of blood taken from the jugular vein in the neck. That bile is capable of being taken up by the absorbents is further apparent from the fact that when the cystic duct is permanently shut, the bile disappears gradually, but entirely, from the gall-bladder."—*Sir Thomas Watson's Lectures.*

inflammatory tumefaction of the duodenum or of the lining membrane of the duct, with exudation into its interior; 3rd, obstruction by stricture or obliteration of the duct; 4th, obstruction by tumours closing the orifice of the duct or growing in its interior; 5th, obstruction by pressure on the duct from without; 6th, obstruction by parasites."—*Williams*.

Symptoms.—General depression, inactivity, loss of appetite, suspension of rumination, bowels constipated, and the fæces of a light drab or clay colour—or relaxed, the fæces being mingled with mucus, and offensive; urine high-coloured, hot, occasionally turbid, and stains yellow; pulse increased, contracted, and hard. The skin is of a deep yellow tinge, especially on the thin parts, as over the abdomen, inside the thighs, fore-arms, and ears. The same colour is present on the visible mucous membranes of the eye, conjunctiva, inside the lips, the gums, and vagina. The mouth and muzzle are dry and hot, the breath offensive; the horns and ears are alternately hot and cold, the coat rough and staring. In cows the quantity of milk is diminished, and it likewise has a yellow tinge. There is pain, on pressure, over the region of the liver, with sometimes enlargement and hardness. Thirst is also usually present.

Convulsions, succeeded by a profound state of coma, generally precede death, and a peculiar offensive odour is emitted.

Occasionally jaundice is seen in pregnant cows, which is due to uterine pressure, and generally disappears after parturition.

Treatment.—It is essential in prescribing for jaundice that the cause should first be ascertained. If due to congestion or inflammation of the liver, the treatment already set down for those maladies should be adopted. When the disease proceeds from inspissated bile or gall-stones, in which case the urine is generally turbid and the pain more acute, calomel and opium will be found serviceable.

If the disorder is due to non-secretion of bile, especially from innervation, aloes and calomel are called for. Benzoic acid has also been recommended. Taraxacum, nitro-muriatic acid and ox-gall have also been successfully prescribed.

When jaundice proceeds from the immoderate use of purgatives, the administration of mucilaginous drinks and alkalies with opium is indicated.

When diarrhœa is present an oleaginous draught may be first given, followed, if necessary, by small doses of opium. If the evacuations are excessive, and attended with great straining, starch and opium enemas should be administered.

Bleeding in jaundice is of no earthly use. If the pain is acute, counter-irritation to the hepatic region will afford relief and prove beneficial.

Where the liver is feeble, vegetable tonics are useful.

The diet should be plain, unstimulating, and laxative. Moderate exercise may be allowed, but exposure to cold or damp must be strictly guarded against. Animals once affected with jaundice are peculiarly liable to a return of the complaint, and therefore need more than ordinary attention.

GALL-STONES.

The presence of calculi in the gall-bladder of cattle is not a matter of easy discovery, and such a diagnosis is only usually arrived at by symptoms of liver disorder and the intestinal evacuation of such concretion.

"Biliary calculi are not unfrequently found in the gall-bladder of cattle, of varying size, from that of a pin's-head to a large walnut. Their form indicates that they are composed by some process of crystallization; they are round, with concentric circles, or conical, or assuming in a rude way the form of a cube, or a pentagon, or hexagon. There is usually some central portion of harder bile round which the rest is collected. They are of less specific gravity than the bile, and even than water, and are found swimming in the gall-bladder. They are composed of the yellow matter of the bile, with a portion of mucus holding it together; and this colouring matter is valued by the painter on account of its peculiar and almost unrivalled permanence. It is insoluble in water and alcohol, but it readily diffuses itself in a solution of potash.

"So far as can be observed, the presence of these calculi in the

gall-bladder does not inconvenience the animal, or interfere with health, for they are found in the greater number of oxen that are brought to the metropolitan slaughter-houses. At all events, there are no recognised symptoms by which their presence can be detected, or even suspected. In some cases the writer of this work has detected more than a hundred small calculi in the bladder of one ox.*—*Youatt*.

The fact that gall-stones often exist without causing pain is, says Dr. Budd, "explained by the circumstance that the gall-bladder does not contract on the stones, and is perhaps seldom completely emptied, and that gall-stones are so light that they are suspended in bile, and, in consequence, exert no pressure on the coats of the bladder by reason of their *weight*. It may also be owing in part to the little sensibility to pain which the gall-bladder has when not inflamed."

A gall-stone, however, may pass into the cystic duct—the canal which conveys the bile to the intestine, where it usually at once becomes obstructed; but even here it may remain for some time without creating any more serious symptoms than those of disordered digestion. In time, however, its irritation causes spasmodic muscular contraction of the duct, which ultimately distends and allows the passage of the calculus into the common duct, and thence to the duodenal opening. Here again it is generally delayed, and symptoms of pain, resembling colic, are manifested, until the sphincter dilates and the calculus finds its way into the intestine.

Treatment.—This consists in allaying the pain, dissolving any stones which are still present, and preventing the formation of fresh ones. Opium fulfils the first measure; its combination with sulphuric ether is also recommended. Dr. Prout has advocated large draughts of hot water containing carbonate of soda in solution, as often affording more relief than any other means. "The alkali counteracts the distressing symptoms produced by the acidity of the stomach: while the hot water acts like a fomentation to the seat of pain."

* "The number of calculi sometimes contained in the gall-bladder is almost incredible. Morgagni took 3,646 out of this reservoir belonging to a human being; and in the Hunterian Museum, at Glasgow, 1,000 are preserved, which are stated to have been extracted from one gall-bladder." —"Cyclopædia of Practical Medicine," article "Jaundice."

As a solvent for gall-stones, alkalies, for a time, but with doubtful success, were in vogue. Then followed the combination of æther and turpentine, which, if not containing the necessary solvent properties, appears in many cases to have done good—probably as an anodyne.

Concerning the prevention of the formation of gall-stones, we must chiefly rely upon the management of the animals: such as exercise, proper diet, regulation of the bowels. Where there is an habitual unhealthy state of the liver, mercury, taraxacum, chloride of ammonia and alkalies prove serviceable. The former drug, however, is not advisable when any organic disease of the liver exists.

SPLENIC APOPLEXY.

Though splenic apoplexy is essentially a blood disease, and should perhaps have found a place in the chapter specially set apart for such maladies, yet in dealing with the diseases of the liver and spleen, this one necessarily comes under notice.

Splenic apoplexy belongs to the anthracoid class of diseases, and is one of extremely common and fatal occurrence in cattle.

Causes.—A rich and stimulating diet predisposes cattle, especially young ones, to splenic apoplexy; hence it frequently occurs among animals in high or *forced* condition. Sudden change of pasture from poor to rich often brings about the same result. Ill-drained land, particularly during hot weather, and impure water, are also fruitful causes of the malady. On the other hand, it has been met with on high and dry land, but upon which the crops had been forced by a superabundance of rich manures. A few years ago I was requested to visit a baronet's estate in Shropshire relative to a fatal disease which had been rife among the deer, and had destroyed large numbers, and concerning the nature and cause of which many opinions had been given—prominent among them being *rabies*. I was soon convinced by the symptoms exhibited by several in the park, and by the post-mortem examination I made on three, two of which had died, and one was shot purposely for me, that the malady

was splenic apoplexy. An inquiry into the management, etc., of the herd left no room for surprise that such an outbreak should occur. For years no fresh blood had been imported—no deviation from their daily park-pasture food adopted, while their water was supplied through sewerage-pipes from the hall; in other words, the latter stood on an eminence, and the pipes conveying the refuse, etc., from the hall emptied themselves on the park grass; and when I approached these outlets, which were surrounded with large stagnant, filthy-looking pools, teeming with decomposing matter, the stench was most sickening. When I was informed that this disgusting fluid was reserved for the deer, that they thrived and did better on it than on pure or clean water, and that such a supply had always been the order of the day there, I began to wonder whether this was really the nineteenth century, or how it was possible that such an idea (that a saturated solution of beastliness was preferable to pure water) could for a moment find tenancy in the mind of any civilised person. However, it is hardly necessary to say I ordered a very opposite system of management, with satisfactory results.

Gamgee observes: "In the United Kingdom, and even in France, there is a certain irregularity in the development of the anthrax poison in splenic apoplexy, and this has led to some persons doubting whether the disease was really anthrax. It certainly appears that the waters animals have access to when they become affected with this disease, may be *apparently* pure, but are usually highly charged with organic products, the results of decomposition. Professor Voelcker analysed the water which cattle drank in Somersetshire, where splenic apoplexy prevailed, and found that it contained no less than 235 grains of solid matter in the imperial gallon, composed of various medicinal salts which necessarily affected the animals' whole constitution. The water was clear-looking. I have noticed that waters drunk by cattle under similar circumstances have been highly charged with mineral and organic products, and pike in canals and rivers containing such water died."

Symptoms.—So sudden sometimes is the seizure and death that no preliminary symptoms can be observed. Animals apparently healthy the night before, are found the following morning dead and stiff. Frequently, especially it has been stated in the case of working oxen, the animal suddenly falls, becomes convulsed, and sanguineous

foam issues from the mouth and nostrils. In other cases, partial paralysis in the hind-quarters, or staggering, with inflamed eyes and profuse lachrymation, is observed before falling. While in others, considerable excitement is manifested, and sudden symptoms of pain are exhibited resembling colic. The visible mucous membranes are injected; the eyes prominent and bloodshot; the urine turbid, high-coloured, and not unfrequently sanguineous; the faeces are also dark-coloured and often mixed with blood. The creature isolates itself from its companions; stands as it were in a heap, with the back arched, and frequently backed against a tree or some solid structure. The pulse is rapid and hard; the breathing hurried, short, and often stertorous; appetite and rumination are suspended; there is alternate temperature of the body; and, as in every case, the animal sooner or later falls, becomes convulsed, foams, and dies.

In those cases where the disease is less rapid, a more defined symptomatic line is described, according to Fleming. "There is a cessation of rumination, and loss of appetite; weakness or prostration ensues, with stupor or great excitement; shivering and general or partial sweatings appear; or the skin, which is harsh and dry, is hot and cold alternately; tremblings manifest themselves; along the spine and the ribs pressure causes pain; the muscles in some regions, especially that of the neck, contract spasmodically, and these contractions are often accompanied by plaintive lowing. The contractions become more marked as prostration increases; if the animal is made to move, it staggers and stumbles, and progression is nearly impossible; it often falls, and has great difficulty in getting up. About this period, a foetid and sanguinolent diarrhoea sets in, accompanied by abdominal pain, which the animal indicates by frequently looking to the flanks. The expression is that of stupor, and the dull dead appearance of the eye is very characteristic; at the same time the heart-beats are loud and tumultuous, and the pulse is small, very quick, and irregular; the temperature of the body may be high, but the legs and face are cold; the respiration, at first sighing and plaintive, soon becomes panting; the muzzle is dry, and the mouth cold and filled with foamy saliva; the tongue is pendent and violet-coloured, the buccal membrane yellow, and the animal grinds the teeth; the conjunctival membrane is of a black or reddish-violet hue; the eyes appear to protrude more than

usual beyond the orbits, and the pupils are dilated. The abdomen becomes distended, the animal falls, blood flows from the nostrils, and the foam from the mouth is blood-coloured; and convulsions, especially of the limbs, commence, and in some animals are so severe that it is dangerous to go near them. Usually, however, the prostration is extreme, the body is cold, and the animal either perishes during one of these convulsive attacks, or in the calm which succeeds it. Death, the usual result, may occur in a few hours. If there is no remission, it may take place in two hours; but if the alteration be not so great, or the power of resistance stronger, the animal may linger from twelve to thirty-six hours.

"It must be added, nevertheless, that some cases, with less intense symptoms, may live for several days, and that these are the rule in certain localities, and at a certain period in the course of an epizooty. The disease in these cases might, with justice, be distinguished from the more severe or apoplectic form, and receive the designation of anthrax fever.

"It usually commences with a rigour that may easily pass unperceived, and this is followed by a high temperature; there is the usual debility and indifference, with obtuseness of the senses, and low hanging or unsteady head, and fierce expression. The animal bellows and strikes at the abdomen with its hind feet, and the eyes appear to start from their sockets. The temperature of the body is constantly changing, the limbs being usually cold; the pulse is very quick, and almost imperceptible; the mucous membranes are hot, and reddish-yellow in colour; the muzzle is dry, and the teeth are continually ground. The appetite and rumination are frequently suspended altogether, and there is sometimes thirst present. The faeces are dark-coloured, dry, and often mixed with blood, and it is not unusual to observe symptoms of violent colic.

"With milch cows, the secretion of milk is considerably diminished, or quite suppressed; but so long as it continues, it does not offer any alteration, except in some cases it has a dirty light-blue tint, is viscid and insipid, and quickly putrefies.

"In those instances, which last only from twelve to thirty-six hours, these symptoms rapidly increase in intensity, and the animal dies in the midst of convulsions, which are ordinarily accompanied

by the involuntary discharge of sanguineous feces. In the cases which are more protracted, there may occur an apparent amelioration of the symptoms, and the animal seems lively; at the same time the appetite returns to some extent. Nevertheless, prostration increases; the senses become more blunted, the respiration and pulse quicker; the secretions of the mucous membranes more abundant; dark-coloured blood escapes from the mouth and nostrils, and the diarrhœa which ensues is largely composed of blood; the abdomen is tympanitic; the body is cold; convulsions appear; subcutaneous emphysema is developed along the back; and the animal generally succumbs in from the third to the seventh day."

Post-mortem Appearances.—After death the body speedily decomposes, and distension rapidly takes place. Extensive bloody infiltrations are found under the skin, and the latter is itself congested. The abdomen usually contains a quantity of bloody serum. The spleen is immensely enlarged, and of a purple colour; not unfrequently it is ruptured. The kidneys are dark and ecchymosed, and occasionally the bladder is discoloured and distended. The stomachs sometimes present extravasations of blood, and a similar condition is found in the heart and lungs and in the cranium, and along the spinal canal.

Treatment.—"Many cases prove fatal, whatever treatment may be adopted. Success has attended the practice of those who have aimed at moving the affected animals rapidly about, dashing cold water on their bodies, and following this up by a full dose of purgative medicine, with carbonate of ammonia. In the earliest stage of splenic apoplexy bleeding may be of service. Preventive measures should be resorted to, and those consist of low diet, active exercise, purgatives, and neutral salts in water."—*Gamgee.*

SPLENIC FEVER.

Splenic, Texas, or Spanish fever is a disease which has commanded lately much attention. It is a peculiar and fatal form of anthrax known on the American continent, which has been observed wherever and whenever cattle from the States or the Gulf of Mexico have been driven northwards during the summer months.



FIG. 5

THE SPLEEN IN CASE OF SPLEENIC FEVER.
FROM THE REPORT OF THE COMMISSIONER
OF AGRICULTURE U. S. D.

Being a stranger to the malady, I cannot do better than adopt Mr. Fleming's example in briefly recording Professor Gamgee's careful and able investigation of this disease (see the "Report of the Commissioner of Agriculture on the Diseases of Cattle in the United States," published at Washington in 1871):

"1. The malady is communicated by Southern cattle.

"2. The cattle communicating the infection, though showing signs of splenic enlargement or evidence of once existing disease, when slaughtered, are apparently well and actually increasing in weight and vigour. (While Southern cattle possess the germs of virulent disease, it is rarely, if ever, developed in themselves, at least with the same manifestations and intensity. As prisoners coming from unventilated gaols have communicated typhus to judge and jury without active manifestations of similar disease in themselves, so Texas cattle, coming from miasmatic pasturage, infect cattle of other climates, and cause a disease, unknown in degree, or perhaps in kind, among the stock in which the infection originates.)

"3. Infection is not usually communicated in winter; and fields may be safely depastured in spring which have been occupied in winter by Southern cattle. In a single case reported, an apparent exception occurred.

"4. Animals receiving the infection from Southern cattle do not communicate it to other natives. This exemption is a rule so undeviating that probably not one farmer in a hundred whose stock has suffered by this disease would fear a dollar's loss by communication of his uninfected with sick animals. The authenticated exception occurred at Hamptonburg, New York; and in that no positive proof is given that the animal communicating the infection was not a Texan. (The evidence of an important witness, and which was generally corroborated, was: 'My own experience, and all the authentic information I have been able to obtain, goes to show and prove most conclusively that in the most aggravated cases of the disease among native cattle, and where they are dying by scores, and other native cattle are in a field or enclosure at a proper distance from any point that may have been infected by Texas cattle, you may drive native cattle, sick with this disease, into the field with the native cattle in good health, and not one of the healthy cattle will ever be infected or sick with the disease.' And the New York Commissioners, in their report of 1868 on the malady, say: 'We have not heard of a single case of the disease having been taken by any animal that has not been in contact with Texas cattle or with their excretions. We have had authentic evidence that Texas cattle that have passed over a road, dropping the excrement thereon, have communicated the disease to native cattle that passed over the same road forty-eight hours afterwards.')"

"5. Southern cattle removed to localities characterized by the same climatic conditions (as from one portion of the Gulf Coast to another, or upon the same parallel of latitude), do not communicate disease to local stock.

"6. The virus appears to be eliminated from the system after a stay of a few weeks or months in a Northern climate; so that no infection is communicated to the cattle with which they come in contact.

"7. A preponderance of testimony tends to establish the theory that the infection is conveyed through the voided excrements. It does not appear that the disease has ever been communicated 'except to animals that have fed upon pastures or in lots soiled by the excrements of the Southern cattle.'

"8. The period of incubation is not of uniform length. From causes which it is for medical investigation to determine, the potency of the virus is variable. Sometimes a week intervenes between the exposure and the attack; frequently a period of ten days or two weeks elapses; sometimes two, three, or six weeks intervene; and in one case in Washington County, Arkansas, the time of incubation was three months. In portions of Arkansas in which the climatic conditions are similar to those of the region from which the migrating cattle come, no infection occurs; and in proportion as a section assimilates in climate to such region, it is reasonable to suppose the liability to the disease is lessened, and, probably, the period of its incubation extended.

"9. The disease runs a brief course of a few days, generally but three or four, often but one or two, and proves fatal in nine cases out of every ten.

"10. Liability to infection is so imminent that few exposed animals escape. When circumstances favour the greatest virulence of the disease, whole herds have often been destroyed, and the cattle of entire districts nearly all swept away; while beyond the line of exposure, distinctly marked as the boundary of a sweeping conflagration or resistless tornado, not a herd nor an animal has been touched.

"11. Medication has been of little service, though the testimony gives colour to the probability that a slightly reduced mortality might be secured by skilful medical treatment, and feeding with soft mash.

"12. The losses from this disease for a few years prior to the war, and for years since its close, cannot be accurately stated, but undoubtedly amounts to several millions of dollars. The greatest fatality has been in Missouri and Kansas. In 1858 the loss in Vernon County, Missouri, was 200,000 dollars. Losses were widely distributed and severe throughout Southern Kansas and South-West Missouri in 1866 and 1867; in 1868 they were less in these states, as the result of general enforcement of restrictive laws, but were heavy and alarming in Eastern Illinois and Western Indiana, when the prairie pastures of those states were for the first time occupied by cattle direct from Texas. The deaths numbered about 5,000 in Champaign County, Illinois; 1,500 in Warren, 600 in Benton, and 400 in Jasper, in Indiana; and many counties in these and other states were involved to a less extent. The mortality of 1868 amounted, according to the returns, to at least 15,000 cattle, involving a loss of not less than 500,000 dollars.

"13. While meat of diseased animals can never be deemed wholesome food, the milk and flesh of cattle affected with this disease do not generally cause immediate sickness. With regard to the latter part of this statement, one witness reported that 140 head of native cattle died from Texas fever in 1868 on the farms in his charge, and among them nearly all the cows, whose milk was used with impunity until its secretion ceased; the calves sucked as long as their mothers could stand, and in one instance a calf sucked three cows alternately until each died. In some cases the hogs consumed the carcasses of dead cattle; and yet there did not occur any accident from the use of this flesh and milk.



Fig. 15

THE HEART OF THE FISH
FROM THE REPORT OF THE COMMISSIONER
OF AGRICULTURE, U. S. A.

"It appears, and with good reason, to be looked upon as a climatic disease, and the opinion seems to be that it can never involve in general destruction the cattle of the country by successive generations of the virus, as in the case of the rinderpest and other contagious maladies of that class, and 'that its ravages may be easily confined to certain limits, if not prevented altogether, by judicious legislation which shall not interfere seriously with the freedom or the profits of the cattle trade.'

"Professor Gamgee's conclusions are :

"1. That Southern cattle, especially from the Gulf Coast, are affected with a latent or apparent form of the disease.

"2. That they become affected in consequence of the nature of the soil and vegetation on which they are fed, and the water which they drink.

"3. That their systems are charged with poisonous principles which accumulate in the bodies of acclimatized animals that enjoy an immunity.

"4. That Southern cattle may be driven so as to improve in condition ; and yet for some weeks, and probably not less than three months, continue to excrete the deleterious principles which poison the cattle of the states through which the herds are driven on their way north or west.

"5. That all breeds of cattle in states north of those of the Gulf Coast, without regard to age or sex, if they feed on grass contaminated by Southern droves, are attacked by the splenic fever ; that the disease may be, but is very rarely, propagated through the feeding with hay.

"6. That the disease occurs mainly during the hot months of summer and autumn, and never after the wild grasses have been killed by frosts, until the mild weather in spring returns ; that the grasses are healthy, and continue healthy, unless fresh droves of Texas or of Florida cattle are driven over the land.

"7. That heat and drought aggravate the disease in individual animals.

"8. That the splenic fever does not belong to that vast and deadly group of purely contagious and infectious diseases of which the rinderpest, the lung-plague, and eruptive fevers are typical.

"9. That it is an enzoötic, due to local influences, capable of only a limited spread, and analogous to or identical with the 'black water' of various parts of Europe.*

"10. That, however warm the weather may be, cattle affected with splenic fever have not developed in their systems any poison like the anthrax poison ;† and that the flesh, blood, and other tissues of animals are incapable of inducing any disease in man or animals.

"11. That splenic fever is not malignant typhus nor typhoid fever. That it has no analogue among human diseases, but is, however, developed under conditions which prevail where the so-called malaria injuriously affects the human health.

* "There, nevertheless, appears to be a wide difference between the Texan fever and what is called 'black water,' one of the most important distinctions being the infectiousness of the first. Indeed, the points of resemblance between the two maladies appear to be very few.

† "There does not appear to be any experimental proof of this. The origin of the disease, the region in which it is engendered, the season in which it appears, the necroscopical appearances in those animals which have perished from it, and the symptoms observed during life, ally it closely to certain forms of anthrax. Anthrax is a common disease in South America."

"The disease sometimes runs its course rapidly, the first indication of its presence being a dead animal. The earliest suspicious symptom is an increase of temperature.

"The ordinary symptoms are drooping of the ears, sluggish gait, and checked secretions.

"In cows giving milk, the quantity may be reduced to one half, or even less. At first the animal eats, ruminates occasionally, and its paunch appears full; but soon there is a disposition to lie down; and wherever pools exist, the sick cattle are inclined to lie in the water. In some cases there is cough. The depressed head, drooping ears, arched back, hollow flanks, tendency to draw the hind-legs under the belly, and knuckling over at the fetlocks behind, are early and marked symptoms. The skin is dry and rigid; the faeces not usually much altered at first, though in some cases evidence of slight hemorrhage may be noticed. The visible mucous membranes are rather pale, though a congested condition of the nasal membrane and a discharge of glairy mucus has been seen; the membrane lining the rectum is reddened. The pulse is frequent and small, and becomes imperceptible as death approaches. The temperature varies with the degree of blood extravasation. The breathing is hurried and often laboured. In some animals—those with great restlessness and tendency to delirium—the respirations have been counted as high as 100 per minute, and in comatose animals they are slow, deep, and stertorous.

"There are marked nervous phenomena, indicated by twitchings and tremblings of the muscles, and in nearly all the cases there is unsteadiness of the posterior extremities in progression, and great difficulty in getting up. Great listlessness and stupor are indications of early death. There is oedema between the branches of the lower jaw, or below the chest. The faeces are stained with blood, and the urine is deeply coloured by that fluid. After death the bladder is found greatly distended.

"In the majority of cases, the depression and listlessness increase, the pulse is more frequent, the respiration more laboured, and the temperature reduced, the animal stretches out on the ground on which it has been lying motionless for some time, and dies without a struggle (Gangjee).

"The post-mortem appearances are very similar to those already described as present in anthrax fever.

"The preventive and suppressive measures should be the same as those recommended for anthrax.

"Medical treatment has hitherto proved of but little value."

Following the report just given, we have another exceedingly interesting one seven years later (*Veterinary Journal*, January, 1878), from the pen of Veterinary Surgeon J. Myers, of Cincinnati, Ohio, which I think in a work of this description it is advisable to give in full, more especially so as the information given in home works is extremely scant and unsatisfactory:

"To the *American Veterinary Review* for November, 1877, Veterinary Surgeon J. Myers, of Cincinnati, Ohio, contributes an interesting paper on the peculiar and somewhat obscure disease known as 'Texas Fever,' which has recently been prevailing somewhat extensively in some parts of the American



Fig. 10

THE KIDNEY IN DYSPEPSIA, FEVER
FROM THE EFFECT OF THE HEMORRHOIDS
OF AMERICAN L. S. A.

Continent, as we intimated in the *Veterinary Journal* for last November. Seeing that live cattle are now imported into this country from the United States, it is imperatively necessary that everything relating to the contagious disorders of stock on the other side of the Atlantic should be known here. We therefore consider this, the latest contribution to the literature of the disease, worthy of transference to our pages.

"Mr. Myers writes: 'The scrupulous management of the sanitary police ordination on the Eastern Continent partly, and partly the contemplated exportation of American cattle, induced me to draw the attention of the veterinary profession to this enzooty—viz., Texas Cattle Plague, Texas Fever, Spanish Fever, or Splenic Fever—the propagation of which is thought to be due to contagion. The virus is generated within cattle of the Gulf region (being endowed with mysterious properties), and is transmitted by them in the eastern and central States, where they spread the disease among the cattle with which they come in contact, while their own health remains unimpaired. Considering these circumstances, it is quite probable that the authorities of such districts in which foreign cattle are unloaded, will enforce protective measures against the invasion of plagues; and, moreover, should one or more among a lot of these bovine emigrants prove indisposed—which is very likely to be the case when such dumb animals as have never been incarcerated before are doomed to a fortnight's rail or sea journey—they would make their inspection with even more precision. As to the extent to which such sanitary precautions are necessary, the following facts in reference to the disease may be taken into consideration. Incomplete as they are, I deem it justifiable to communicate fragments, expecting by these means to stir up scattered relative substance, which might in the end serve as a foundation of trustworthy instruction as to how this evil might be prevented or cured.

"**SYMPTOMATOLOGY.**—This disease, which is compared with, or even identified as, Anthrax, is characterised by the painless evacuation of a reddish-black, sometimes coffee-coloured, turbid, though not always abnormally odoured, urine; this, after standing for twenty-four hours, throws down a brick-coloured precipitate, which is sometimes streaked with blood. At the same time the secretion of milk is suspended—a circumstance which first attracts the owner's attention. Rumination is suspended, and food is refused, though there is a moderate desire for water. The patient remains apart from the other animals in the herd, with hanging head, ears drooping, viscid saliva flowing from the mouth, mixed with mucus from the nostrils, muzzle moist, an inconstant discharge from the eyes, and the conjunctivæ pale, with the larger vessels prominent, but not engorged. At the commencement the temperature is increased, then fluctuates and finally decreases. When the animal is standing, the limbs approach each other; in the recumbent position they are flexed, the head being extended, with the lower jaw resting on the ground; if an unsuccessful attempt is made to get up, the animal falls again upon its side. During the first stage the gait is "dragging," gradually becoming unsteady, and at last altogether impossible—indicating a complete collapse of the nervous and physical force. The mucous membranes, particularly that of the buccal cavity, present a greyish hue; deglutition is sometimes impaired; the feces at the commencement are soft, and occasionally streaked with blood—the colour depending upon the kind of food previously consumed; and if the patient

lingers for a number of days the consistency is changeable: the peristaltic movements are evidently sluggish, but symptoms of Colic pains have never been observed. The frequent respirations are sometimes accompanied by cough and mucus, though without any energetic action of the abdominal and thoracic muscles. In the majority of cases the circulation keeps pace with the respiratory acts—the pulse numbering from 80 to 120 per minute—and as it increases it loses its tonicity. The action of the heart is, in general, scarcely perceptible.

"About two-thirds of a pint of blood drawn from the jugular vein more resembled arterial than venous blood, it coagulated within ten minutes, the supernatant serum being of a reddish-yellow tinge. It must be understood that the symptoms are not at all times the same, they being dependent upon the progress of the case. The most important diagnostic symptom is the urine: but since we are unable to be present personally at all times, the history of the case as given by the attendant (however unreliable it may occasionally be) must suffice, and is indispensable unless previous cases appeared in like manner, and which, of course, must be traced in the same way.

"**PATHOLOGICAL ANATOMY.**—In one instance I observed post-mortem rigidity, which I did not notice in others. Tympanitis, as well as emphysema, I noted only in such cases as had been dead for several hours; while in those which had just expired there was collapse of the abdomen. The bloodvessels of the subcutaneous tissues were very seldom engorged. In some cases the muscles were pale, and in others bluish-tinted. The adipose tissue usually presented a healthy aspect, though in some instances it was yellowish-coloured. The abdominal cavity generally contained from one-half to one pint of serum. The external surface of the stomach often had an abnormal appearance; where it was in contact with the liver it had a yellow hue, and with the spleen a sanguineous tint. The rumen was nearly always very full of food; the reticulum was either partly or entirely empty; the omasum was filled with the usual quantity of dry food, though in exceptional cases it was empty; and the abomasum nearly always contained an offensive "mashy" mass. The contents of the ileum, caecum, and colon were in nearly every instance of a like offensive character; and dry, oftentimes bloody faeces were found in the rectum, unless death occurred during purgation. The external aspect of the alimentary canal seldom afforded any evidence as to its interior, the tinge being usually yellow. In those animals which had been destroyed the mucous membrane showed traces of inflammation, while in those which had died it was partially detached, had a greyish hue, and the denuded muscular coat was congested; the mucous membrane of the small intestines was softened, covered with bloody mucus, and the intestine itself was distended with gas; Peyer's patches were enlarged and livid. The internal coat of the large intestines, as well as a portion of the ileum, presented circumscribed greyish-green or yellowish patches, which had a gangrenous odour. The latter change was not observed in those cattle which were destroyed; in those the liver, in the second stage of the disease, was merely enlarged—indicating the existence of acute or subacute inflammation; in those which died, this organ was generally found to be undergoing decomposition: externally, it was either of a yellowish, brownish, or brick colour; the veins traversing it contained a small quantity of purple-tinted blood. The gall-bladder was usually filled



FIG. 50

ILLUSTRATING THE LIVER IN THE YELLOW FEVER
OF THE LIVER IN CHOLERA FEVER

with dark-coloured bile of the consistency of honey, or a more normal fluid of a yellow or greenish colour. In destroyed cattle the spleen was enlarged, its texture only slightly altered—in fact, it was merely in a state of hyperemia. In those which died it was more voluminous and emphysematous, and its pulp was semi-fluid and viscid, something like decomposed blood. The lumbar and iliac glands in two cases I found considerably enlarged, and in a decomposed state. The colour and texture of the kidneys were varied; the parenchyma of those destroyed at the commencement of the disease presented a hyperæmic, slightly swollen, dark-red, but compact appearance; while in those which died it was quite black or dark-grey, softened, and apparently at the point of dissolution. The bladder, in the majority of cases, was filled with a blood-red or coffee-coloured urine, which readily responded to the tests for albumen; and the mucous membrane was relaxed, though there was no trace of inflammation. The lungs were generally healthy, the few exceptions showing that the inflammatory alterations were caused by irrational drenching, these being traced as high as the larynx; in such cases not only was the lining membrane of the trachea, but also the subjacent muscular and cellular structures were infiltrated with blood. The heart was pale and flaccid; and in one case the endocardium was ecchymosed on the right, in another on the left, and in a third on both sides; in those which died, this organ contained ash-grey and dark-coloured fibrinous clots. In a few exceptional cases the pericardium contained several ounces of serum. The vena cava usually contained small quantities of blood or clots, some of which, on account of their consistency and discolouration might have been taken for pathological products.

“The analysis of the blood, undertaken by order of the Board of Health, did not yield any satisfactory result. In order to satisfy my own curiosity, I requested an expert to examine such blood microscopically—suspecting blood changes, as in Anæmia, Leukæmia, and the like; but he naively informed me that he was only acquainted with the analysis of human blood. The symptomatology of this disease, as described in the handbooks at my disposal, differed from that of my cases; therefore I was the more anxious to know with what I had to deal.

“The progress of this disease is rapid, the majority of animals expiring within two and a half to four days; in exceptional instances it extended to seven and eight days. The course of the malady appeared to be governed by variations in temperature; I, at least, observed that animals attacked in the months of July and August ran a more rapid course than those affected in September.

“ETIOLOGY.—Some individuals claim this as a mystery; others assert that it is originated by direct contagion communicated by cattle transported from the Gulf regions; but cases have come under my observation in which I was unable to trace any contagion, and which had all the evidence of spontaneous origin. For this reason I cannot agree with the aforesaid assertion unconditionally; although we have sufficient proof that cattle running at large, or in pasture where they may come in contact with the Texas cattle, are more readily exposed to infection than those kept in stables; and from May until October exclusively, and less in wet than in dry seasons, when the scarcity of fresh good water compels them to quench their thirst with stagnant water. In this way numberless infusoria, and other matters deleterious to health, are conveyed into the system—the result being a contami-

nation of the chyme, the composition of which, besides the withered grass, consists of innutritious and even toxic vegetation (as when animals desire to refresh themselves with something cool and juicy, they will eat plants and drink water which at other times they would refuse), thereby infecting the alimentary canal and its associate organs. The injurious effects are not confined to the vascular system alone, but extend to the adenotonic organs in the abdominal cavity. The organs are important agents in the formation and purification of the blood, and therefore, becoming impaired as soon as these obnoxious ingredients arrive for transformation or elimination, injury is inflicted not only on the glands themselves, but on the entire organism. All this may, under favourable conditions, be sufficient to develop an infectious germ; and in this way we may have spontaneous cases of the disease, which carry the virus wherever the sick animals may be carried—whether among the mature bovine inhabitants of hilly countries, or those of lowlands and valleys, or creek and river precincts, particularly those districts influenced by the tide.

“Whether the infective principle is fixed or volatile, and what its *modus operandi* is, remains to be ascertained. Considering the locality in which the disease most frequently appears, we are obliged to attribute some share to miasmatic influences. The evidence before us inclines us to believe that the system of southern stock must be impregnated with the effluvial atmosphere prevailing in that climate. This may account for the inviolability of that stock, and the tenacity of the virus which our native stock inhale from their excrements. Even the expirations may be charged with poison, and will act as such in the summer if the animals change their home to any north-eastern States. It is also asserted that they are subject to infection after becoming acclimatised.

“Not having anything important to add to this miasmatic topic, I do not hesitate to acknowledge my predilection for the germ theory, which accounts for the otherwise mysterious sweeping away of entire herds, dairies, etc., within a week or two. Innumerable statements as to such mortality are made in agricultural reports and periodicals; but the sporadic outbreaks are almost entirely ignored. To prevent the disease, it is necessary, in the first place, to examine thoroughly into its causes and nature; the latter is a problem yet to be solved, but must not be neglected if prophylactic measures are to be instituted with a view to prevent such calamities. My experience of the disease prevents me giving a positive opinion as to its period of incubation; but from two days to five weeks seems to be the average time the poison requires to develop the disease.

“The prognosis is unfavourable, especially in midsummer. With regard to treatment, no remedy has, as yet, given satisfaction. The salicylic and carbolic acids, with some mucilaginous infusions, seldom did any good. Bromide potassa, with glycerine, and extract eucalyptus globulus and water, proved to be no better; nor did quinia give any more favourable results. Fomenting the abdomen with warm water, and also applying mustard or red pepper thereto, were also resorted to. I must, however, admit that all my therapeutical experiments were unsatisfactory; the rapid course of the disease, and lack of time to give proper attention to the action of medicines, frustrated a systematic procedure.

“It appears to me likely, if not certain, that this morbid condition is dependent on an acute decomposition of the blood (*seps sanguinis*), chiefly

manifested in the abnormally-coloured urine, the colouration being due to some liberated hæmatin and cholechrome. The malady appears during the hot summer months.

"Calves and other ruminants have been exempted from it. A superficial examination of the disease at once shows that its analogy with Anthrax is untenable. Yet Mr. Fleming, in his excellent work on "Sanitary Science and Police," favours this idea. I also express doubt as to paragraph 4, page 212, vol. ii., in that work, which states as follows: 'Animals receiving the infection from southern cattle do not communicate it to other natives,' etc. I have no positive proof to the contrary; but in order to caution interested individuals, I deem it necessary to cite two instances which will not correspond with the assertion of Mr. Fleming. Two years ago, at midsummer, a farmer, Mr. Hamilton, near Hamilton, Ohio, made a contract with two drovers to supply him with neat cattle, *home-bred*. They fulfilled their engagements so far as two lots were concerned. The second transport arrived two weeks after the first. Two days after the second lot arrived, one of them became ill and died. Twenty four hours subsequently, one of the first lot was also attacked, and succumbed in two days. From this time forth one or two were effected every day, without distinction of lots, until the drovers took away the remaining ten of the last lot, the others apparently mending. A repetition of the same occurrence took place at a distillery in my neighbourhood. All went well until the second division was installed—when sickness set in; but owing to the low temperature which came to their rescue, only four per cent. were lost. In this last instance we see the malady break out in the stable: the animals are fed on hay and corn-swill (seldom heard of); and in both instances the native cattle have been apparently disseminating the ailment among themselves. Not having evidence as to whether one or all have been infected by the Texas stock, I leave it to others to make their own comment."

CHAPTER IX.

DISEASES OF THE URINARY ORGANS.

Albuminuria. — Hæmo-Albuminuria. — Hæmaturia. — Nephritis. — Hypertrophy of the Kidney. — Atrophy of the Kidney. — Cancer of the Kidney. — Abscess of the Kidney. — Fistula in the Kidney. — Calculus in the Kidney. — Retention of Urine. — Incontinence of Urine. — Cystic Calculus. — Paralysis of the Bladder. — Hernia of the Bladder. — Rupture of the Bladder.

IN studying that portion of the organism, the function of which is the removal from the system of superfluous water and other excrementitious products of the blood, we have offered for our consideration what is termed the *urinary apparatus*. This consists of (*a*), the kidneys; (*b*), the ureters; (*c*), the bladder; (*d*), the urethra. The kidneys are for the purpose of urinary secretion. The ureters convey the urine to its reservoir, the bladder; and the urethra is the canal through which it is from time to time discharged.

As the kidney of the ox is anatomically different to that of other animals, I think it may be desirable to briefly point out the differential characters as described by Chauveau: "In the ox, the kidneys have an elongated shape from before to behind, which is altogether characteristic; and, in addition, they preserve during life the lobulated form only seen in the other animals during intra-uterine existence. Each agglomeration is composed of from fifteen to twenty secondary kidneys; but the pelvis is not formed in the centre of this agglomeration, being carried altogether outward, and occupying an excavation in the inferior face of the organ, which represents the hilus. This cavity is divided into as many short, wide prolongations—the *calices*—as there are principal lobules; the uriniferous tubes from each lobule open on a small papilla, which projects into the bottom of the calyx. This papilla is, therefore, nothing more than the crest of the simple pelvis in the kidney of solipeds (Fig. 53).

ALBUMINURIA.

Albuminuria, though usually associated with *hematuria* and *red-water* in cattle, is now recognised by veterinary pathologists as a distinct disease.

Causes.—The presence of albumen in the urine may arise from cantharidine absorption, indigestion, lesions of the nerve centres



Fig. 51.

Fig. 52.

Fig. 53.

KIDNEYS OF THE OX.

Fig. 51.—Right kidney, viewed on its upper and external face. Fig. 52.—Left kidney, from its internal and inferior face : 1, pelvis ; 2, 2, 2, 2, branches of the pelvis terminating in calices ; 3, ureter ; 4, renal artery. Fig. 53.—The calices in the left kidney. The contents of the hilus, including the branches of the pelvis, have been removed to show the tubercles at the bottom of these calices. Only seven are visible, the others being beneath the borders of the renal fissure.

from injury or cold, and from various diseases of the kidney, particularly that form known as *Bright's*, in which its presence is permanent.

Symptoms.—The albuminous character of the urine is the most positive proof of the existence of the disease. If examined


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microscopically, cylindrical or tube-like bodies (coagulated albumen) will be observed. At the same time in examining urine for the presence of albumen, it must be borne in mind that its discovery and apparent quantity will depend upon existing circumstances.

Physical Character of Urine in Bright's Disease.—"Colour, smoky-brown; easily froths, owing to the presence of albumen; specific gravity low—average 1.014—by abstraction of urea. Quantity of urine much diminished, owing to the reduced proportion of water. Subsequently, the urine becomes pale and opalescent, and is less apt to froth, there being much less albumen; the specific gravity declines yet lower, down perhaps to 1.004, while the quantity of urine is increased, approaching even to diuresis. The reaction is, generally, much less acid than in health.

"The specific gravity of the serum of the blood is reduced to 1.018 or even to 1.015, as compared with that in health, which ranges between 1.029 and 1.031."

Microscopical Character.—"Casts of the uriniferous tubules, blood, and perhaps pus, may pass into the urine, which presents accordingly characteristic appearances under the microscope; but their description scarcely relates to the composition of the urine secreted."

Chemical Tests.—"The solid constituents of the urine, amounting in health to about 68 in 1,000 of urine, in Bright's disease decline to 14, 12, or even 6 parts only in 1,000. This is chiefly due to the abstraction of urea, alluded to in connection with the altered physical character of the urine. The quantity of albumen contained in the urine varies exceedingly—from a mere trace, to possibly 545 grains in the twenty-four hours."—*Parkes.*

"The presence, or, as in the early stage it might be termed, the substitution of albumen for urea, is easily discovered and readily distinguished, provided only certain precautions be observed in making the examination.

"They relate either to the chemical composition of the urine submitted to examination, or to the tests employed; chiefly these precautions have reference to the urine itself.

"Thus, if the urine be alkaline, or even neutral—whether from the presence of volatile alkali, carbonate of ammonia, or from fixed alkali, as soda—either alkali will combine with albumen, and neither of the resulting compounds being coagulable by heat, the

urine remains clear when heat is applied. The albumen is not discovered, although perhaps abundant. Or, again, if an opposite condition exists—should the urine be over-acid, from the presence of a free acid, as the acetic or hydrochloric—the acid will combine with albumen, and the acetate and hydrochlorate of albumen being uncoagulable by heat, the urine remains clear when heated. The albumen is concealed.

"Supposing, however, that, on the application of heat, a white flaky precipitate does fall, resembling albumen, it may not be albumen. Earthy phosphates are likewise precipitated by heat. To distinguish between these two deposits—phosphates and coagulated albumen, as well as to evolve albumen concealed by an alkaline or over-acid state of the urine—heat having been applied, nitric acid (strong) should then be dropped into the test-tube containing supposed albuminous urine. If the deposit be phosphates, they are redissolved; if albumen, it is more firmly coagulated.

"In short, *heat* clears off any difficulty arising from lithic acid, the lithates, and urea; *nitric acid* clears off any difficulty arising from the (earthy) phosphates, at the same time liberating and evolving albumen from any prevailing alkaline or mineral acid condition.

"Nitric acid, in respect of its behaviour to albumen, disputes with heat the privilege of disclosing the presence of this abnormal constituent of urine. Nitric acid unites with albumen, forming what may be called nitrate of albumen, which is not coagulable by heat. Consequently, if only just so much acid be added to albuminous urine as shall combine with all the albumen present and form this nitrate, none of the albumen will appear when heated. Nitrate of albumen, being *insoluble* in nitric acid, appears when *more* acid is added; but is again redissolved on the addition of an *excess* of acid. This happy *medium* quantity of acid is necessary to exhibit albumen—not just an equivalent, which, combining with the whole amount present, renders it insoluble, although heated; this would be too small a proportion of acid: while an excess, above that proportion in which the nitrate of albumen is insoluble, redissolves it.

"To strike the balance, and moreover obviate all other possible difficulties to which I have referred, the right method of examining supposed albuminous urine is simply this: Pour a *small* quantity, say a fluid drachm, of the urine in a test-tube; heat it to the

boiling-point, and then drop in *two* or three drops only of strong nitric acid. If phosphates have been precipitated by the heat applied, they will be redissolved, and the white flakes of coagulated albumen appear more clearly. On being allowed to stand, it will subside in the tube, leaving the urine above clear; thus defining the quantity of albumen present in any given quantity of urine examined. This will be found, as already said, to vary between two extremes—a slight white cloudiness subsiding as a little flaky deposit, or part or the whole sample becoming solid and white, like coagulated albumen of an egg in the tube.

"To exactly estimate the quantity of Albumen.—Either of the two following processes may be resorted to. Take 500 grains of the urine of twenty-four hours and boil it in a flask, nitric acid being added subsequently to secure coagulation of the albumen, and to dissolve any of the phosphates deposited by boiling. Then let the coagulated albumen subside by standing the flask, decant off the clear fluid, and throw the residue upon a weighed filter. Wash the collected albumen on the filter with hot distilled water, to bring away saline matter; dry on the water-bath and weigh. Or acetic acid may be added, in just sufficient quantity, and the urine boiled, thus to effect coagulation. The process is then completed in like manner."—*Gant*.

In addition to the albuminous urine, the animal has a stiff straddling gait behind, and is continually crouching and stretching itself out. There is but little constitutional disturbance in the early stages, the pulse and breathing being scarcely affected. As the malady proceeds, the urine becomes darker in colour, thicker, and more mucilaginous; the pulse and breathing are increased. The animal exhibits pain, and, unless relieved, paralysis ensues, and death takes place from blood-poisoning.

Pathological Anatomy.—"The anatomical characters of the kidneys in this disease are of two kinds, and are spoken of as the *large white* and the *small red* kidney. If a longitudinal section of the large kidney be made, its cortical portion is seen to be much increased; the organ is soft in consistence, smooth upon its surface, and upon its investing membrane; whilst the small kidney is hard and red, rough upon its surface, and its investing membrane firmly adherent."—*Williams*.

Treatment.—This may be briefly summed up as follows:

Mineral tonics and acids, regulation of the bowels, wholesome food and demulcent drinks.

HÆMO-ALBUMINURIA.

Hæmo-albuminuria in cattle is commonly known by the term red-water, also bloody urine, moor-ill, black-water, hæmaturia, etc. The former term, signifying that hæmatine and albumen exists in the urine, thus almost at once, as it were, describing the nature of the complaint, is one for which we are indebted, I believe, to Professor Simonds.

Perhaps of all the category of diseases which come within the scope of the veterinary practitioner, there is few of so old a type as red-water. In ancient works on farriery, before colleges were instituted, or perhaps thought of, we read of this disease; and in modern works on cattle pathology it still occupies a prominent place in their pages.

Causes.—It affects both young and old stock of all breeds, male and female; but, according to Professor Simonds, it prevails, at least in some parts of England, more amongst cows than oxen, and particularly after parturition. One of the reasons he assigns in part for this, is the change of food and management to which the animals are subjected, viz., the cow having prior to calving been kept on short commons, and then immediately after bringing forth her young being supplied with abundance of rich food, in order that she may give a great quantity of milk. The digestive system, unprepared for this, is consequently unable to sustain so sudden a change. It gives way, and thus cows, being subjected to this treatment, are more generally affected than oxen.

Another and prevailing idea as to the cause of this malady is that of cattle being placed in low and wet pastures, and this is in my opinion influential in its production, which is plainly shown by its being so frequent in the undrained parts of England, and likewise taking place in those seasons of the year when we expect changeable weather, viz., spring and autumn. Mr. Ford, in a letter to Mr. Youatt, which is mentioned in his work on "Cattle Pathology," states that red-water used to be very prevalent in the neighbourhood of Etruria, in Staffordshire, about twenty years from the time

he wrote. And before the wet lands were drained, in a dairy of twenty or thirty cows, two-thirds of the number, he says, were afflicted with the disease annually; but since the draining, not more than one or two animals have annually been attacked by it.

Mr. Nobbs likewise, in writing to Mr. Youatt, states a case where a dairy was removed from a farm on flinty soil to one on strong clay, and every one of the cows, consisting of seventeen, were affected; three of them dying, although they had been "charmed" (an old custom which is happily dying out, and giving place to more sensible ideas).

These two instances, with many others which I might enumerate, go a great way to prove that damp seasons and wet pastures have much to do in the production of red-water; still we must not lose sight of the food as participating in the cause, for as in cows, so in oxen, this—though not perhaps in the same way—may assist in producing red-water, such as the change from poor to luxuriant pastures, or partaking of plants whose acrid properties irritate and inflame the mucous membrane of those organs in which digestion is carried on, and thus interfere with their natural functions, and secondarily, through them, the kidneys.

Professor Simonds says he has known red-water occur from the substitution of cotton-cake for oil-cake, which from its coarseness causes diarrhoea, and thus by impairing the digestive system lays the foundation for this disease. The immediate cause, however, of the malady is undoubtedly a vitiated condition of the blood, produced in a great measure by the quality of the food, which food deranges the whole digestive system, and through that alters and deteriorates the condition of the blood and other fluids of the body; and, associated with this, may be named atmospherical influences and the circumstances under which the animal is placed.

Professor Williams says: "I am induced to conclude that the disease originates in an impoverished condition of the blood, arising from want of proper food; that the albumen of the blood is thus degraded in quality, and as such is unfit to be appropriated for the nourishment of the tissues, and is consequently excreted by the kidneys and expelled from the body; that the blood-globules are in a broken-down or disintegrated condition, arising from solution

of their outer layers or cell walls, when their coloured interior—hæmatin—escapes, which, mixing with the serum of the blood, and being eliminated by the kidneys, gives the characteristic tinge to the urinary secretion."

Post-mortem Appearances.—A general anæmic condition pervades the body—the heart and bloodvessels being usually empty—extravasated blood-spots are found on the serous membranes. The kidneys have a blanched appearance, and if the animal has lived five or six days they are in a soft condition, and on pressure a reddish fluid oozes out. On dissection, the ureters are found to be stained the same colour, but the organs themselves are rarely inflamed. The bladder may contain more or less of the abnormal urine, and within the uterus there is frequently some dark mucus. The stomachs are generally full, the ingesta within the omasum being especially dry. In the majority of cases the liver is congested, softened, and its structure easily broken up. The gall-bladder is distended with bile, of variable consistency and tinge, being most frequently dark and thick. The skin and tissues underneath are of a yellow tinge, which tinge appears in many other parts of the body according to the progress of the disease.

Symptoms.—Hæmo-albuminuria is generally ushered in with diarrhœa, followed by a constant endeavour on the part of the animal to urinate, the fluid of which is a claret colour, becoming deeper as the disease proceeds. Then the very opposite of diarrhœa takes place, viz., the non-passage of feculent matter, but which arises not so much from a constipated as a torpid state of the bowels, because the colon and rectum after diarrhœa are generally empty, so that though there may be a constant straining, there is really nothing in the shape of feces to come away; and in the treatment of many of the diseases we are called in to attend, this should be particularly borne in mind, especially when about to administer purgatives, and those of a drastic kind.

The pulse, which is at first quick and small, becomes nearly imperceptible, and the beating of the heart is easily increased in rapidity by alarm. The secretions generally are suspended. In cows, the milk has an unusually yellow tinge. The skin of the udder, and particularly on the inside of the thighs, where it is thin and naturally of a whitish colour, has also a yellow hue. This

yellowness is due to absorption of bile into the system, though Professor Simonds holds a contrary view, and says it is due to a reddish-coloured liquor sanguinis flowing in the capillaries.

But the most prominent and striking symptom of this disease is the red urine, and concerning the nature of the discharge, and the cause of its peculiar colour, various pathologists have been at issue. This characteristic urine does not commence in the earliest stage of the malady, but generally sets in after the diarrhoea has ceased. It is first of a light claret colour, gradually deepening as the disease proceeds, becoming in the latter stages of a dark brown colour, and still deepening until it has become nearly black, hence it has been termed at this stage black-water, but which in reality is the concluding stage of red-water, and is considered by many practitioners to be a favourable symptom. Concerning the cause of the discoloured urine, various theories have been advanced, the oldest and until lately the most prevalent of which is that it is due to hæmorrhage from the kidneys; but, as Professor Simonds remarks, we must bear in mind one thing—if there is any blood in the urine it will clot, no matter how little the quantity, whilst we find in this disease the urine is quite transparent. This alone should convince us there is no escape of blood from the kidneys. Another idea, at one time current, was that bile in the urine was the cause of the change of colour; but tests for this fluid being resorted to, it, like the former, proved to be erroneous. A third opinion was, that imperfectly formed blood had got into the urine and imparted to it the red tinge.

Professor Simonds' view, and the one which I myself take, is, that deteriorated blood is the specific cause, and that the hæmatin, or colouring matter of the blood, leaves the red cells by the laws of exosmosis (*i.e.*, by an outward current), and contaminating the liquor sanguinis, or liquid part of the blood, so tinges the urine.

Duration.—The duration of the disease is from five to six days; should there be no diminution of the symptoms by the third or fourth day, an unfavourable prognosis may usually be given.

Treatment.—Bleeding has been strongly advocated by some practitioners as the first thing to be resorted to, and as strongly condemned by others. I for one am very averse to bleeding, if it can be avoided. It is very easy to take half a bucketful of blood from an animal, and may look important, but it cannot be put back

again in so short a space of time; and it is not unfrequently taken away at the time the sufferer most requires it. However, there are of course cases in which it is beneficial; and in the early stages of red-water, if the animal is in a plethoric state, it may be an advantage to have recourse to venesection if practised cautiously, as it tends to alter the condition of the blood by unloading it to a certain extent of its morbid matter. But apart from this, I think more faith should be put in internal remedies. Here, again, we have diversity of opinion—some advising astringents and other purgatives, followed by diuretics. With regard to diuretics, they tend to excite (in this disease) an already abnormal condition of the kidneys into an inflammatory one, and thus retard rather than aid Nature's efforts to bring about a healthy state of the blood. Astringents I am favourably inclined to, but in the use of these I should go no further than sulphate of iron, or tinct. sesquichlor. ditto, the former in $\frac{1}{2}$ ounce doses twice daily, the latter in 1 ounce doses the same. These preparations are, in my opinion, the best agents we can use to improve the tone of the blood, constrict the bloodvessels, and so prevent the escape of hæmatin. It is, however, always advisable in the first instance to unload the stomach and bowels by the administration of a saline purgative.

Magnes. Sulph.	12-16 ounces.
Potass. Nitrate.	$\frac{1}{2}$ ounce.
Zingib.	2 drachms.

In 3 pints of warm water.

The temperature of the patient should be equalized by rugs and warm housing, and good nursing throughout is essential. The sequel of this disease, which has already been briefly alluded to, is black-water.' This, like the former, derives its name from the colour of the urinary discharge, and in my opinion this black hue is due, if I may so express it, to death of the hæmatin; viz., that as it ceases to escape from the vessels, so does the inclination of the animal to urinate subside, and thus the colouring matter, being retained a longer time in the bladder, affords opportunity for this change to take place. In treating a case at this stage, presuming it has not come earlier under notice, diuretics and tonics will be found the most effectual remedies, as 1 ounce doses of terebinth and the pre-

scribed quantity of sulphate of iron, together with nutritive and easily assimilated diet.

Preventive Measures.—As to the prevention of red-water, it will have been gathered from what I have already said, that keeping animals on well-drained pastures, avoiding sudden changes of diet, and not unnecessarily exposing them to inclement weather, are matters of importance, and therefore these may be laid down as a few simple but necessary rules, which will, if observed, assist in lessening the number of cases belonging to this class of disease. There is one disease which it may be as well in concluding to briefly mention, inasmuch as the term it is known by has been applied to red-water. I allude to *Hæmaturia*, which, rendered literally, means blood with urine, or hæmorrhage from the kidneys, and which is a distinct disease from the other. *Hæmo-albuminuria* or red-water is caused, as we have seen, by atmospherical influences, damp pastures, coarse—or the other extreme—rich food, after low diet; in fact, mostly traceable to things that impair the digestive system: whilst *Hæmaturia* is generally brought about by external violence, such as blows to the loins, falls, bruises, or great strain of the part or parts immediately connected with the kidneys; or it may and does frequently occur from calculi in those organs or their ureters which impede the flow of urine and set up inflammatory action, or by their irregular edges wound the inner coat of the ureters, and thus cause the discharge of blood. Not merely hæmatin, but absolutely coagulated blood is passed with the urine, which it has been previously shown does not exist in true red-water. Thus these two terms, *Hæmaturia* and *Hæmo-albuminuria*, signify, or ought to signify, two separate diseases, and according to that difference so must our treatment be.

Hæmaturia demands primarily very immediate and soothing measures, and what would be useful in the early stages of red-water would prove hurtful in hæmaturia. This is one of the instances of the necessity of a correct nomenclature.

HÆMATURIA.

I have already briefly pointed out the distinguishing nature, causes, symptoms, and treatment of this malady in my remarks in

the preceding disease, but it will probably be advisable, in treating it as a distinct section, to enlarge upon those observations.

"Blood in the urine, or simply bloody urine, is a *symptom* only of disease in some part of the urinary organs. Varying in quantity, from a small proportion discoverable only by the microscope, to an amount constituting the greater portion of the fluid passed, the admixture of blood and urine may be estimated by corresponding differences in the colour of the urine. When blood is present in small quantity, the urine has a brownish or smoky tint; and deposits a reddish-brown, muddy colour like chocolate; and deposits a red sediment, adhering to the bottom of the vessel. Intermediate tints are met with, according to the admixture of blood. Heat coagulates the blood into a brownish-grey deposit, leaving a clear fluid above; and microscopic examination exhibits the characteristic red blood-discs. These tests, especially the latter, will show the presence of blood in the urine, and thus distinguish hæmaturia from simply dark reddish-coloured urine, due to other causes—bile, rhubarb, and other colouring matters—or to mere concentration of the urinary secretion.

"The *source* of the blood in hæmaturia, and thence the seat of the disease, may be any one or more of the following parts: (1) the kidney; (2) the pelvis of the kidney; (3) the ureter; (4) the bladder; (5) the prostate; (6) the urethra."—*Gant*.

Causes.—Hæmaturia, as already observed, is generally brought about by external violence, as blows to the loins, falls, bruises, or undue strain of the part or parts immediately connected with the kidneys, or it may and does frequently occur from calculi in those organs or their ureters, which impede the flow of urine and set up inflammatory action, or by their irregular edges wound the inner coat of the ureters, and thus cause the discharge of blood. Not merely hæmaturia, but absolutely coagulated blood is passed with the urine. Powerful diuretics, as turpentine and cantharides, will also produce hæmaturia, and it has been known to accompany various diseases of the bladder and certain blood affections, notably purpura.

"The *diagnosis* of the *source* of blood in the urine is the same as of these causative conditions. But the general ground of distinction is this: When hæmaturia is renal, the urine will be uniformly mixed with the blood; when it is vesical or prostatic, the

first portion of the urine that passes, or that is drawn off by the catheter, will be pale or less bloody than the last, and at the termination of the stream pure blood only may escape; when proceeding from the urethra, the blood may be mixed, but more often unmixed, with urine, passed also in the form of worm-like clots or casts of the urethral canal, and independently of micturition."—*Gant.*

Treatment.—Hæmaturia demands from us prompt and active measures; nothing irritative must be administered. Drastic purgatives and diuretics must be avoided, and in their stead mucilaginous drinks should be given, together with the use of hot fomentations to the loins (some persons prefer cold applications to the loins, perineum, and within the rectum), or counter-irritants, as mustard or ammonia embrocation, sedative enemas and preparations of iron, or the acetate of lead combined with opium, or tannic acid, gallic acid, or sulphuric acid, should form the chief part of the medicinal treatment. In vesical hæmorrhage, the oil of turpentine is spoken of as specially efficacious, in moderate doses, suspended in mucilage. "The management of the blood collected in the bladder has given rise to a diversity of opinion. It is recommended that the coagulum should be broken up and withdrawn by the introduction of a full-sized catheter, to which a syringe is then applied, the blood being thus gradually extracted by suction; or the bladder can be washed out by means of a large-eyed double-current catheter. Generally this disturbance of the clot would seem to be unnecessary and prejudicial. Its removal is apt to reopen the vessels and renew the hæmorrhage, while the solvent action of the urine will most safely and effectually bring away the blood. Opium may succeed in controlling the urgent desire to micturate; and when absolutely necessary to relieve retention of urine, surgical interference can be resorted to."—*Gant.*

NEPHRITIS.

Nephritis, or inflammation of the kidneys, is not an uncommon disease in the cow, and is occasionally met with in working oxen.

Causes.—Blows over the region of the loins, violent strains, slipping up or backwards, partaking of irritant or poisonous plants, the administration of powerful diuretics, especially turpentine and cantharides, and continued diet of stimulating food.

Symptoms.—Abdominal pains resembling colic, with constipation, are usually present; the animal stands with arched back, and crouches on spinal pressure. The gait is straddling and stiff, the urine is passed frequently in small quantities, with pain and straining, which is continued after its passage; it is deep in colour, and turbid, and generally contains albumen, and if renal abscess exists, it will be found mingled with pus, and not unfrequently blood—the latter is more particularly the case when calculus is present.

The general fever always accompanying such cases is indicated by a rapid and somewhat hard pulse, increased temperature at the roots of the horns and ears, injection of the visible mucous membranes, dry and hot muzzle, and hurried breathing. The appetite is considerably impaired, or lost, and there is usually great thirst; as the disease advances the pain becomes more acute, the animal manifests a strong inclination to move, and moans; the straining is continued, the bowels variable, sometimes offensive diarrhoea being present, at others obstinate constipation; the breathing is more accelerated, the appetite entirely lost; the surface of the body and extremities grow cold, and approaching death is apparent. As this draws still nearer, a strong odour is emitted from the skin and evacuations; perspirations are continual, the eyes unusually lustrous, the breathing short and laboured, pulse imperceptible, and the patient is completely prostrate. (Retention of urine is at this stage generally present.) If moved, the gait is staggering, and eventually the creature falls, paralyzed and unconscious from uræmic blood-poisoning. The abundance of urine in the system gives rise to the emission of powerful uriniferous and ammoniacal odours from the secretion of the skin, and the same is apparent in the fæces.

Post-mortem Examination.—The disease is most frequently confined to one kidney, which is found to be considerably enlarged, dark, and covered with extravasated blood-patches; it is also soft, and easily lacerated. If pus has formed, minute abscesses will be observed covering the surface. The interior of the organ shows a

highly congested condition with or without the presence of pus. The pelvic cavity is also inflamed, and occasionally the adjacent tissues are involved.

Treatment.—This must be of an antiphlogistic character. An aperient should be given at the onset, but not of a drastic nature; aloes especially should be avoided. Linseed oil or sulphate of magnesia are the best agents. A quart of the former, repeated in six hours if necessary, or 14 ounces of the latter. The increased peristaltic action of the intestines thus aroused facilitates the elimination of the accumulated urea in the blood, and delays its poisonous effects.

Counter-irritation in the shape of mustard and ammonia over the loins is serviceable, as also are warm sheepskins. Cantharidine blisters or turpentine must on no account, from their specific action on the kidneys, be applied. To allay the pain, opiates are best adapted. Bleeding I do not advocate, unless it can be done locally (and there is a strong pulse), which in the ox is not easy.

("If the suppression continue for several days, or if at any time uræmic intoxication becomes apparent, it is necessary to excite the secretion of urine; and the best and safest method of doing this is by the application of digitalis to the skin in the form of a decoction, repeatedly applied as a fomentation to the loins, or as a poultice. It must, however, be discontinued immediately after the kidneys have commenced to react. I can speak with great confidence of this remedy if thus applied."—*Williams*.)

The diet should consist of soft easily digestible food, of a mucilaginous nature. Well-boiled oatmeal-gruel, bran-mashes, and linseed-tea; barley-water, unless the patient voluntarily drinks it, should be horned down three or four times a day. Exposure to cold and wet should be avoided for some time after recovery.

When nephritis assumes a chronic form, treatment is unsatisfactory; and as consignment to the butcher is not desirable, it is better to destroy the animal and dispose of the carcass in other ways.

Remarks.—"This disease is so rarely seen in its pure form, and so commonly associated with other diseases involving neighbouring parts, that its correct diagnosis is often a matter of great difficulty; and one of the best means of ascertaining its existence is by introducing the hand up the rectum, and applying pressure to the left

kidney (the right will generally be found out of reach). In case of disease, the animal will evince the most distressing pain upon the pressure being applied.

"When the disease assumes a chronic form, it is astonishing how much mischief can and will go on, and yet the animal evince little or no symptoms of it; an occasional fit of colicky pain, attended with a little difficulty in urination, will be the only evidence of what is found after death to be an almost total change in the structure of one or both kidneys, and it is only when these organs become absolutely incapable of performing their office that acute symptoms set in. In these chronic cases, little or no good can result from medical treatment, and the animal should at once be consigned to the butcher."—*Dobson*.

HYPERTROPHY OF THE KIDNEY.

Hypertrophy and atrophy of the kidney are conditions met with in nearly all animals. *Hypertrophy* signifies an increased volume; *atrophy*, waste. In the ox the two may co-exist; *i.e.*, one kidney may be enormously enlarged, while the other is abnormally small. Both conditions are morbid ones, and are the result of excessive or deficient blood supply.

"When the capillaries of a part deposit an amount of plasma simply sufficient to supply what is dissipated by the current expenditure, the result is normal; the condition is that of health. When more is exuded than is required to atone for waste, there is necessarily accumulation of the excess; the condition is a morbid one, and termed hypertrophy. When, on the contrary, deposit from the capillaries is insufficient, by deficiency of arterial supply; or when absorption exercises its function to excess; the condition of deposit remaining unaltered from the state of health, the result is an opposite kind—still morbid—and called atrophy."—*Miller*.

Causes.—Renal hypertrophy may proceed from inflammatory action, especially that of a low or chronic type; or it may arise from various perversions of nutrition, and from increased functional activity, as may be induced by large or repeated doses of diuretic medicine, or from increased strain on one organ, owing to loss of the opposite.

In the bovine species, hypertrophy is usually a post-mortem discovery. Treatment, if adopted, would, if arising from inflammatory action, be antiphlogistic. In an advanced case, and with a serofulous diathesis, the iodide of potassium internally, and iodine externally, would be the measures indicated.

ATROPHY OF THE KIDNEY.

Atrophy, as already observed, denotes waste of tissue, resulting usually from defective nutrition.

"In most cases, it is probable that both circumstances concur to establish the result, although the major part is attributable to the latter. The part is gradually diminished in bulk, its structure usually becomes somewhat modified, and its function is more or less deranged.

"This state may follow on inflammatory action; as a remote consequence, not as a direct result. The connection is usually with the chronic form. That action ceasing, absorption busies itself to remove the loaded change of structure; and this exaltation of function may be continued beyond what was necessary to restore the healthful balance. Besides, that disuse of the part which attends on chronic inflammatory action will necessarily have the effect of diminishing the arterial circulation; and this latter cause of wasting may be further contributed to by a remaining change of structure in the part itself. Or any of these causes may of themselves be equal to the result. Thus, a testicle which has been simply inflamed, may become simply atrophied; a limb which has been long disused, on account of inflammatory disease of a joint, or from any other cause, invariably is more or less wasted; granular disease of the kidney is accompanied or followed by decrease in the bulk of that organ."—*Miller*.

The treatment of atrophy of any part of the organism consists in correcting defective nutrition, and this is chiefly fulfilled by counter-irritation or galvanism.

CANCER (ENCEPHALOID) IN THE KIDNEY.

The following interesting case of cancer in a cow's kidney is recorded by Prof. Walley in the *Veterinary Journal* for July, 1878:

"Subject, a five-years-old cow; history unknown; sent into Leith abattoir for slaughter; said to be affected with pleuropneumonia zymotica. Mr. Reid, V.S., inspector, called my attention to the kidney after its removal from the body; also informing me that numerous growths were found on the omentum of a somewhat similar character, but harder. A quantity of fluid was also found in the peritoneal cavity. The kidney, with its surroundings, at first sight had the appearance of a ragged encysted pleuropneumonia lung; a small portion of its inferior surface was visible, the remainder being covered by an immense quantity of adventitious matter, which resembled somewhat a mass of organized lymph. The whole mass weighed about 24 pounds. On making a longitudinal section through it, the kidney was discovered embedded in the new growth, the organ itself being about six times its normal size, and separable by the finger from the capsule, which was extremely thickened and intimately connected with the surrounding material. The external surface of the kidney had preserved its lobulated character; internally it was considerably altered, the interpyramidal connective tissue and the pyramids themselves being largely invaded with the encephaloid matter. Some of the pyramids were entirely destroyed; in others about one-eighth to half an inch of the base was left; only one apex could be discovered. The cortical portion was not so much removed or invaded—here and there being very thin, but on the whole about half to three quarters of an inch thick. In a few spots invasion could be seen extending in it and through it, so as to be visible on its internal surface. The posterior third of the kidney was entirely destroyed—being replaced by masses of encephaloid varying in size from a walnut to, in one instance, a large organ. The largest mass had undergone softening—fatty degeneration—and was bestudded with small cysts containing creamy matter; in some instances sanious, urinous in others. When the contents of the cysts were pressed out, an alveolar stroma was left. The colour varied considerably:

in the more recently invaded portions there was much vascularity, and hence a variegated appearance; in the advanced portions, the colour was of a dirty grey, and here and there a yellowish-grey colour. Several cysts were found in the interior of the kidney, containing a dark sanious-coloured fluid. Another large cyst containing the same kind of fluid was discovered between the lobules externally, and a still larger one in the same position containing a yellow transparent fluid—the cyst and the fluid closely resembling a hydatid cyst and contents; but on collecting some in a glass for microscopic examination, and allowing it to stand for a few hours, a distinctly urinous odour was evolved, and several crystals of oxalate of lime, with a few cancer-cells, were detected by the aid of the microscope.

"The adventitious mass surrounding the organ was firmer in consistence—opaque, white, and exuded a large quantity of creamy fluid on section or on pressure with the back of the knife; it had bloodvessels scattered through it, and here and there isolated patches of a very vascular nature; its internal surface (moulded to the exterior of the kidney) was concave and smooth, the external surface being lobulated and more vascular.

"Under the microscope, numerous epithelial cells were seen, some containing nuclei and nucleoli. They were intermixed with lymph and red blood-corpuscles, and in the less advanced portion with small quantities of delicate fibrillated stroma. In every part, but more particularly in the degenerated portions, myriads of free nuclei were present, with molecular matter and broken-up cell-structures.

"As I did not see the post-mortem, I can give no idea of the character of the omental new formations; but I have no doubt, from Mr. Reid's description, they were of a similar nature to the renal growth. Whether the latter was secondary or primary, I cannot pretend to say. I am inclined to think it was secondary. In the portion of the growth lying over the upper surface of the kidney, the posterior part of the left diaphragmatic crus was detected. It had lost nearly all the physical character of healthy muscle—being soft, of a dirty brick-red colour, and rather glistening."

ABSCESS IN THE KIDNEYS.

Abscess in the kidney is usually the result of congestive or inflammatory action, arising from disease or injury. Such a condition is more frequently discovered in post-mortem examinations than during life—though in the latter, excessive tenderness about the loins, difficulty in urination with the mingling of pus, constitutional disturbance and emaciation, may lead the practitioner to a correct diagnosis.

In the *Veterinarian* for June, 1869, the following case is recorded by Mr. S. B. Phillips, M.R.C.V.S.:

"The subject of the disease was a cow belonging to Mr. Chesworth, of Longslow. She was noticed to be ill on the tenth day after calving, and presenting the following symptoms on Mr. Phillips's arrival—constipation, coma, coldness of the extremities, dry muzzle, cold tongue, pulse about 60.

A purgative and enema was given, followed by a diffusible stimulant, and cold water applied continually to the head. The following day she was sensible, bowels relaxed, and altogether seemed better. An aromatic tonic was administered, and gruel ordered.

On the 12th the patient was up. She had been straining very much, especially defecation, and was very much swollen round the near hip and along the course of the lumbar vertebrae. A blister was applied to those parts and a sedative given, and quietude enjoined.

13th. Much worse as regarded straining. An examination per rectum revealed intestine forced very much to right side by some enlargement; an obstruction was also felt per vagina. A sedative was given, and an unfavourable prognosis.

From this date she lingered on to the 7th of April, when death took place. A post-mortem examination revealed one of the kidneys misplaced, and containing an abscess, from which six quarts of purulent matter was evacuated. The other kidney was comparatively healthy.

FISTULA IN THE KIDNEY.

This likewise may be the result of congestion or inflammation within the kidney; it is usually associated with abscess, and is only discovered after death.

CALCULUS IN THE KIDNEY.

Renal calculi are not unfrequent in the ox: they vary in size from a shot to a hazel nut or even larger. Like most calculi they are formed in concentric layers, having a nucleus of some distinct substance. Frequently several are found in the same kidney, either lodged in the infundibula, the substance of the gland, or in the pelvis, according to their situation and the time of their retention there. The shape of the calculus corresponds—hence we often find renal calculi presenting accurate casts of the pelvis or infundibula. Their presence is very apt to create inflammation and suppuration, and the stone may then be evacuated externally; more frequently, however, they descend by the ureter to the bladder.

Symptoms.—The symptoms of calculi in the kidney are seldom recognized during life. Tenderness over the loins; frequent micturition with pain and heat; blood and occasionally purulent matter mingled with the urine; stiffness in the hind quarters, very often to a greater extent on one side than the other; and sharp pains resembling colic, and general febrile disturbance, are among the symptoms exhibited in renal calculi. During the descent of the stone, particularly if the surface be irregular, and wound the inside of the ureter, the pain is considerably aggravated, and the inflammation may extend to the bladder; if delayed in their passage, dilatation of the ureter above the obstruction takes place, and atrophy of the kidney, from its function becoming interfered with, results.

Treatment.—The treatment of renal calculus should be chiefly of an alleviative nature, and to favour the descent of the stone. Purgatives and diuretics prescribed by some authorities should be used with extreme caution. Oleaginous aperients are the safest, and diuretics should consist chiefly of nitrous æther or nitrate of potass in plenty of water. Turpentine under no circumstances must be given; its powerful action on organs in an already irritable, or probably an inflamed condition would be attended with great danger. Mucilaginous drinks, as linseed tea, barley-water, or a solution of gum acaciæ may with advantage be frequently allowed. Warm fomentations to the loins are useful, and opium or chlorodyne will assuage pain.

Nephrotomy or the external extraction of stone by cutting down on the gland, as adopted in human surgery, would scarcely be warrantable in the lower animals, unless the patient was of considerable value, and a positive diagnosis had been arrived at.

RETENTION OF URINE.

This may proceed from paralysis of either the muscular coat of the bladder, compression of the urethra by enlargement of the prostate gland, bruises to the perinæum, calculi in the urethra or bladder, urethritis, stricture, blood-clots, diseased penis, imperforate urethra, inversion of the vagina.

Symptoms.—The animal exhibits great restlessness, with a continual and vain endeavour to urinate. The gait is awkward and straddling. Pain and anxiety is depicted on the countenance, and the nose is frequently turned towards the flanks. In lying down, the act is performed as it were reluctantly, owing to the distension of the bladder, and immediately the ground is reached a grunt or moan is emitted. If relief is not speedily afforded, the pain and straining becomes more severe, the pulse rises, the breathing is hurried, perspirations, sometimes of a urinous odour, ensue; the poor creature reels about, becomes comatose, and dies.

Treatment.—If the bladder be emptied, immediate relief is afforded, but this is often only temporary; the urine is quickly secreted again, and often with the same result: watchfulness is therefore necessary. If the patient be not thus relieved, the intense pressure on the bladder gives rise to acute inflammation or paralysis, decomposition of the urine takes place, sloughing of the coats of the bladder follow, ultimately they give way, and the contents are poured into the abdominal cavity.

The passage of the catheter is necessary in all cases where the retention occurs from mechanical impediment to the outward flow of urine.*

* In the ox, on account of the anatomical arrangement of the penis, which is of a tortuous character beyond a certain distance, taking as it were a double curve (Fig. 54), it is impossible to pass a catheter direct into the bladder from the commencement of the urethra; the latter is therefore

When the retention occurs from urethritis, hot fomentations, opiates, mucilaginous drinks and emollient clysters are the measures to be adopted.

The same treatment will apply to retention of urine, owing to bruises of the perinæum.

Imperforate urethra, or prepuce, requires immediate opening. Retention from paralysis necessitates the use of the catheter, which should be repeated from time to time; but it is advisable not to withdraw the whole contents at first, otherwise collapse without contraction is likely to ensue; a small quantity of urine left in is more likely to stimulate the organ, and by its warmth aid in restoring it to a natural condition.



Fig. 54.

Strychnine or nux vomica is, in such cases, exceedingly useful.

When retention takes place from disease of the penis, other than

incised at its first curve, and the catheter introduced from thence to the bladder. To avoid wounding the urethral canal at the first curve, Youatt recommends a longitudinal incision in front of the scrotum, six inches in length, through the sheath, upon the penis, and in the direction in which it lies. The penis being exposed, it is seized and drawn forward in its sheath; the muscles relax, the penis is readily brought into a straight direction, and held so for a sufficient time to admit the introduction of a stilet, which should either be composed of whalebone, and very flexible, or it should be made of iron, and jointed, resembling that used for the stone operation on the horse by Mr. Taylor, of Nottingham (*Veterinarian*, 1834). The more flexible the catheter is, the more readily will it accommodate itself to the tendency of the muscles to restore the inverted S curve, and the more readily, likewise, may it be bent round the bony arch beyond, and so diminish the length of the incision which must afterwards be made between the anus and the scrotum.

urethritis, as warty growths, an operation for the removal of the impediment is necessary. (See "Warts on the Penis.")

INCONTINENCE OF URINE.

Enuresis, or incontinence of urine, is more frequently a symptom or associate of some other affection. It is generally met with in young animals shortly after birth. The urine, instead of being evacuated through its natural course, is observed to issue from the navel, the hair of the part being continually wet, and the skin excoriated. In the adult it usually occurs from paralysis, and there is in consequence an involuntary passage of urine, which dribbles away slowly from the penis.

Treatment.—In the form occurring in young animals, Gamgee recommends a couple of silver wire sutures through the opening to close it, or the application of a little powdered sulphate of zinc or copper over the part, so as to induce granulation and cicatrization.

In the adult, *nux vomica*, strychnine, cantharides, iron, and counter-irritation over the sacrum, are the most useful measures; cold-water injections into the rectum are also recommended.

CYSTIC CALCULI.

Stone in the bladder may originate there, or descend thence from the kidney. Often they acquire considerable volume, and may exist singly or in considerable numbers.

Symptoms.—These are a frequent desire to urinate, urine often mingled with blood or mucus; occasionally the evacuation is accomplished in a jerking manner, or a full stream is suddenly stopped, and on change of posture is recommenced. The animal also has an awkward gait, very wide behind, and colicky pains are at times manifested. An examination of the bladder per rectum easily determines the presence of a stone; or in the female, sounding may be had recourse to.

Treatment.—This consists only in removal by a surgical operation. (See "Accidents and Operations.")

PARALYSIS OF THE BLADDER.

This cystic condition may occur from protracted distension of the bladder, owing to retention of urine; or from local or general paralysis, the result of spinal injury, or other and debilitating diseases.

Treatment.—This consists in frequently relieving the bladder with the catheter (unless there be an involuntary passage), but for reasons previously observed, in retention of urine, the whole contents should not at first be removed. We must then endeavour to impart tone to the system by the administration of tonics. The best agents being strychnine or nux vomica, alone or combined with iron. Galvanism is also useful, and counter-irritation over the sacrum and perinæum is sometimes serviceable.

The diet should be nourishing and mucilaginous.

HERNIA OF THE BLADDER.

Hernia of the bladder is not frequently met with in the bovine species, and when such a case occurs, it is usually an accident of parturition. Fleming* makes the following remarks concerning it:

"Inversion of this viscus may occur in two ways: 1. When empty, it may, by a spasmodic contraction of its walls, evert itself—the mucous membrane becoming external and the peritoneal coat internal—and thus turned outside in, it may pass through the meatus urinarius into the vagina. 2. It may, without being everted, escape into the vagina by an old or recent fissure in the floor of the passage. Most of the cases occur during parturition, and when the animal is straining violently, whereby a portion of the contents of the abdomen and uterus are pressed against the bladder, and may thus produce its inversion. It is not at all improbable that the viscus may, in consequence of the pressure it occasionally receives, be in spasmodic state, or the cervix may be dilated and relaxed at times.—*W. A. Cartwright.*

"In the mare and cow the urethra is short, straight, and wide; and this no doubt renders the bladder liable to inversion. Zundel

* "Veterinary Obstetrics," p. 328.

states that it may, during parturition, acquire such dimensions from retention of urine that it will entirely fill the vagina, and protrude externally during the expulsive efforts of the animal.

"However this may be, it is certain that the cystocele will present a different appearance in the vagina according as its peritoneal or mucous membrane is visible; i.e., everted or non-everted.

"In the first case we find a somewhat hard, red tumour, with a corrugated surface, and attached to the floor of the vagina by a short narrow pedicle. Examining the lower wall of the vagina attentively, the meatus urinarius cannot be found, but on the soft pulpy surface of the tumour will be observed two small openings—the apertures of the ureters—from which a fluid continually escapes, and which may be recognized by its odour as urine; this fluid may even be thrown out with a certain degree of force during the labour-pains. These characters should be sufficient to indicate the nature of the obstacle.

"In the second variety, the bladder escapes through a rent in the wall of the vagina, and this rent may only involve the muscular layer—the vaginal mucous membrane remaining intact; or, which is more frequent, the muscular and mucous tissues may be ruptured. In either case there is found in the vagina a round, smooth, and fluctuating tumour, attached to the floor of the canal by a pedicle more or less wide, and beneath which the meatus urinarius can be seen or felt. The most striking pathognomonic feature of this kind of tumour is its rapid growth, in consequence of the accumulation of urine in the interior of the displaced bladder, the fundus of which is towards the vulva, and the neck directed forwards—its position being the reverse of normal; the fundus, by pressing on the urethra—which is doubled on itself—prevents the urine from escaping, and we have in this way a rapidly increasing vaginal tumour. In a case recorded by Violet (*Recueil de Méd. Vétérinaire de Lyon*, 1862, p. 371), the tumour had acquired, within eight hours, a diameter of from eight to ten inches. Such a tumour must, therefore, constitute a more or less serious obstacle to parturition.

"We have pointed out the necessity for a careful examination of the tumour, in order to avoid making a mistake, as the cystocele resembles other tumours, and especially the kysts we have already described, or even the 'water-bag,' and an error in diagnosis may

lead to grave consequences. Such an error is recorded by Charcot (*Journal Pratique de Méd. Vétérinaire*, 1826, p. 165), who, being called up to attend a cow which had been attempting to calve for three days, found, on separating the labia of the vulva, a whitish, tense, and fluctuating tumour. Thinking that this was only the 'water-bag,' he punctured it; when the colour and odour of the fluid which escaped quickly undeceived him. When the bladder had collapsed, he then recognized the tear in the vagina through which the viscus had passed. The cow being in a dying condition and the foetus still alive, Charcot had recourse to the cæsarian section; the calf was saved, but the mother died.

"As the diagnosis of this accident is of so much importance, we will notice the symptoms in greater detail.

"Protruding through the opening of the vulva, or immediately within the labia, will be discovered a tumour of a pyriform shape, and varying in size and colour, according to the duration of the accident.

"Sometimes this tumour will be seen hanging from within the vagina by a kind of peduncle, for at least eight or nine inches, and will contain two or three pints of fluid. At times, the protruded part will be nothing more than a thickening of the bladder, produced by strangulation and inflammation; and it will be changed from its normal colour to that of an inflamed surface, or, if it has been hernied for some time, to a darker hue. Sometimes it will become gangrenous and slough; at other times its surface appears rugged and plicated, and on occasions a large quantity of blood has exuded from its surface. Should there exist any doubts as to the nature of the tumour, the mentus urinarius must be looked for; if that cannot be discovered, then the greatest circumspection should be exercised. The attachment and situation of the protrusion should be noted, and also whether it is continuous with the vagina. The nipple-shaped prominences which mark the openings of the uterus into the bladder should also be looked for, as their presence will at once denote the case as inversion of this viscus, as will the escape of urine from them.

Treatment.—"The chief indication in vaginal cystocele is *reduction*, or reposition of the displaced viscus. This, however, is not always, if ever, an easy task. In a case of simple hernia, the bladder is soon distended by the urine, and owing to the increase in size, it cannot

be returned by the opening through which it passed when was it empty. Compression of its walls will not suffice in the majority of cases to evacuate its contents, because, as has been shown, the weight of the organ lies upon the doubled urethra. To empty the bladder a catheter must be employed; the shoot of an elder-tree deprived of its pith has been successfully used for this purpose on an emergency. Once emptied, according to Saint-Cyr, the bladder easily resumes its normal situation.

"Puncture of the organ has been practised when catheterism was not tried; a fine trochar being inserted obliquely into the upper part of the viscus—which was now of course the inferior part—so as to make it pass for a certain distance between the membranes before entering the cavity of the sac, in this way imitating the entrance of the ureters. The operation was completely successful, as the bladder had been little more than half emptied before the hernia was spontaneously reduced.

"Cartwright says, with regard to treatment: 'Provided we are called to the case at an early period, and before a thickening of the parietes of the bladder and sphincter has taken place, we most probably will succeed. We should, with the left hand, press gently upon the sides, and with the right hand the fundus of the bladder, until we feel it gradually receding from us; after which we may carefully introduce a pessary or catheter, so as fairly to force it into its natural situation. If there should be violent straining at the moment we are employing the taxis, we had better desist for a time, until we have abstracted four or five quarts of blood, or give a dose of opium in solution, to allay any irritation or spasm. But if we cannot succeed in this way, I think a far more preferable plan will be to get a stick with a round blunt point that will pass through the sphincter, and force it against the base of the protruded fundus. A very excellent instrument would be a female catheter, such as is used for the cow or mare, as it would have the necessary curve. In thus trying to re-invert it, we may use considerable force without rupturing it; though, of course, we must be cautious in our pressure.'

"Should the distended cystocele be immediately in the track of the fœtus, and the expulsion of the latter urgent, if the bladder cannot be returned before birth, it must at least be emptied, to allow the young creature to get through the vagina. As the latter

passes over it, the viscus should be protected from injury by the fingers.

"Reduction must be attempted according to the directions given, and care must be taken not to lacerate the organ, as this also will prove fatal. Elmue (Canstall's *Jahresbericht*, 1859) relates an occurrence of this description.

"In desperate cases, when reduction cannot be effected, or when the organ is so much injured that reposition is almost certain to be followed by death, amputation may be ventured upon with some prospect of success.

"With regard to the operation, Cartwright remarks: 'It is to be observed that the ureters enter the substance of the neck of the bladder obliquely towards its sides, but their orifices are to be seen when the bladder is inverted, and the cow or mare is standing up, at the upper surface of the viscus, about half an inch apart. To detect them, we must draw the bladder sufficiently down, so that we may be able to inspect the parts. Where they enter, the inner membrane (now the ureter) will have a soft and jelly-like protuberant appearance, in the middle of which will be detected two very small openings of a nipple-like shape. To be certain that we have hit upon them, we may introduce a probe, and pass it down towards the suspended fundus. Having discovered the orifice of the ureters, and passed a ligature around the neck of the bladder below them, we have nothing more to do than occasionally tighten it, so as to effect complete strangulation and sloughing of the body of the bladder; though, as soon as we find it dead, we may, to save time, cut it away with a scalpel. We should also, after having applied the ligature, puncture the distended fundus; since its great weight may cause a dragging and inflammation about its cervix, or may force the ligatures over the mouth of the ureters, which would occasion the death of the animal. After the separation has taken place, the remaining portion will contract within the vagina, and the cavity will be closed by the vulva. The urine will generally ever after run down the thighs, excoriating them; though in other cases the fluid will accumulate within the vulva, and be from time to time ejected in large quantities.'

"When excision is not resorted to, spontaneous amputation may take place.

"When the inversion or prolapsus is complicated by rupture of

the floor of the vagina, then the accident is of the most serious character, though not invariably fatal in its results."*

* Riviere (*Journal de Méd. Vétérinaire de Lyon*, 1867, p. 236) reports the case of a cow which had a laborious delivery, in consequence of lateral deviation of the head of the foetus, and manual aid was necessary. The foetus was very large, and soon after it was extracted the envelopes came away; but in about a quarter of an hour very violent straining ensued, and almost immediately a quantity of reddish fluid flowed from the vulva, followed by a tumour as large as a child's head. A careful inspection proved this tumour to be formed by the fundus of the bladder, and a manual exploration discovered, on the floor of the vagina, a long slit through which the organ had passed. When this laceration took place was not known; but the owner of the cow had attempted to deliver it the previous evening, and had, as he thought, pierced the "water-bag." The bladder was full of urine, so it could not be returned, nor yet could it be emptied by pressure on its surface. The contents were removed by a hastily-devised catheter, made of a piece of elder-tree deprived of its pith. When the urine was abstracted, reduction was easy, and the cow recovered in less than twenty days.

Several other interesting and successful cases are recorded in other animals. Decléene (*Ibid.* 1876, p. 147) furnishes an interesting case of *retroversion* or *retroflexion* of the bladder against the floor of the vagina, which was inverted by the displaced organ. The amateurs who had tried to relieve the animal—a cow which had just calved—thought the mass was the thickened foetal envelopes of a second foetus, commencement of inversion of the uterus, inversion of the bladder, or hernia of the intestine. The animal was lying when Decléene examined it, and it was breathing quickly, as well as making violent expulsive efforts; during which a round tumour, the size of a man's head, appeared at the vulva, and diminished in size when the straining ceased. The temperature of the tumour was low; it was rather hard, and almost stony in consistence during straining; when there was not straining, fluctuation could be detected. The surface was smooth and regular, except at its posterior part, where were some abrasions, due to the owner's attempts to tear through it, from an idea that it was the "water-bag" of a second foetus. A vaginal exploration proved that the upper and lateral surfaces of the tumour were directly continuous with the vaginal mucous membrane; and that the os uteri was partially dilated, but normal. Internally the hand could not advance far into the vagina, as at the meatus urinarius the mucous membrane was reflected on itself at a very acute angle. In order to pass the finger into the meatus it had to be bent, and even then it could only be advanced a short distance, in consequence of the inflexion of the neck of the bladder.

Moderate pressure for more than five minutes was unavailing in replacing the organ, in consequence of the continuous straining of the cow. The animal was inclined to get up, and at the moment when its hind-quarters were raised, the knees being bent, the pressure forward and a little upward caused the bladder to suddenly resume its normal position and relations. The animal quickly recovered.

RUPTURE OF THE BLADDER.

This accident is fortunately not very frequently met with in veterinary practice.

Causes.—Rupture of the bladder may arise from over-distension, which, when protracted, causes the coats to become paralyzed and consequently weak. It may also arise from various injuries, as in carelessly or roughly casting the animal, by accidental falls, or crushing, and it occasionally happens when the pelvis is fractured.

Symptoms.—"The circumstances which would most unerringly indicate a rupture of the bladder would be the impossibility of detecting that vessel in the pelvic cavity when the hand was introduced into the rectum; or, after the bladder had been felt, round and hard almost as a foot-ball, and the animal had been expressing in every possible way the torture he endured, a perfect calm all at once succeeding. This would probably be hailed by the inexperienced practitioner as a symptom of recovery, but the skilful one would regard it as the forerunner of death. If a day or two had passed since the rupture of the bladder, the experienced eye would detect it by a certain engorgement of the limbs, and particularly of the hind-limbs; and there would often be an evident urinous smell about the animal even before it was dead. In such case, the bladder is commonly found in a state of gangrene; the intestines are highly inflamed, and the whole of the meat is discoloured and nauseous. It is, therefore, of consequence to ascertain the state of these parts during the life of the animal, either that an operation may be attempted, or that the farmer may sell him while there is anything about him that is saleable beside his skin. In fine, when it is recollected that the existence of these calculi betrays a constitutional tendency to their formation, and that the removal of one may at no great length of time be followed by the appearance of another; when, from the length of narrowness, and more especially from the singular curvature of the urethra in the ox, it is in a manner impossible for calculi half so large to pass as those that easily traverse this canal in the horse; and that the walls of the bladder in the ox are so weak compared with those of the horse,

it will become a matter for consideration whether the beast, in good saleable condition, should not be destroyed as soon as this obstruction is clearly ascertained: and, most certainly, the animal that has been successfully operated upon for suppression of urine, and that is not then fit for the market, should be fattened, and got rid of as quickly as possible.

"The cow is in a manner exempt from these sad accidents, because the calculi readily find their way through her short, and capacious, and straight urethra."*—*Youatt*.

* M. Peyron examined a beast that had laboured under suppression of urine for eight days; he was slaughtered, and the bladder was found to be ruptured. No mention is made of any effect produced by the urine in the abdominal cavity, either as exciting peritoneal inflammation or discolouring the flesh; it is, therefore, probable that the rupture had taken place a little while only before death, and perhaps in the act of falling. In another case, the perfect depression of the animal, the feeble and slow pulse, and the staggering walk, coupled with a long suppression of urine, excited a suspicion that rupture of the bladder had already taken place; and on examination after death, the whole of the abdominal cavity was so discoloured by the urine that the meat could not be used.—*Fleming's Veterinary Obstetrics*.

CHAPTER X.

DISEASES OF THE GENERATIVE ORGANS.

Gonorrhœa.—*Warts on the Penis.*—*Scrotal Edema.*—*Enlarged Testicle.*—*Ovarian Tumours.*—*Vaginitis.*—*Inversion of the Vagina.*—*Polypus in the Vagina.*—*Vesico-Vaginal Fistula.*—*Thrombus of the Vagina.*—*Vaginal Laceration and Rupture.*—*Leucorrhœa.*—*Abortion.*—*Retention of the Placenta.*—*Dropsy of the Placenta.*—*Inflammation of the Uterus.*—*Ulceration of the Uterus.*—*Cancer of the Uterus.*—*Inversion of the Uterus.*—*Hernia of the Uterus.*—*Rupture of the Uterus.*—*Dropsy of the Uterus.*—*Uterine Hemorrhage.*—*Uterine Polypus.*—*Uterine Kysts.*—*Induration of the Cervix Uteri.*

GONORRHOEA.

This disease, vulgarly called "bull burnt," is one of frequent occurrence, and often of a troublesome character. It consists in a thick, white discharge from the penis in the male, and from the vagina in the female, and is highly contagious.

Causes.—Sometimes the cause of gonorrhœa is unassignable; it is, however, frequently due to local irritation. An over-heated system is also likely to produce it, which is confirmed by its most frequent appearance during hot weather.

Symptoms.—Male: In addition to the discharge named, considerable pain is exhibited in micturition, which is frequent, and the urine is only passed in small quantities, which is turbid and of a high temperature. The sheath is swollen and hot. More or less constitutional disturbance is indicated by an accelerated pulse, injected visible mucous membranes, constipation, and loss of appetite, with occasionally grating of the teeth, etc.

In the female, the vagina presents a deeply inflamed appearance, covered with discharge; the vulva is swollen, micturition is more frequent than in the male, and exceedingly painful. As the disease becomes chronic, the vagina internally, and the penis externally, will be found studded with minute vesicles which speedily break, coalesce, and form ulcerative sores. This ulceration soon

becomes extensive, destroying considerable tissue, especially in the male, where acrid discharge is more likely to be retained within the sheath, which, together with the penis, becomes involved in the ulcerative process. The constitutional disturbance at this period is very great, and rapid emaciation ensues. Occasionally the os uteri in the female is affected, either from extension of the inflammation backward, or from the male direct. In such a case the discharge is more offensive and abundant, and examination per vaginum reveals the os swollen and hot, its manipulation being attended with considerable pain.

Treatment.—In the early stage of gonorrhœa, revulsive measures may be adopted with success; these consist in the frequent use of astringent injections within the vagina or prepuce, and the administration of copaiba and cubebs in ounce doses, mixed with a pint of linseed oil. My usual treatment, however, is as follows: A saline aperient, cleansing the parts by syringing with tepid water, and the daily injection of the following lotion:

Plumbi Acetat.	1 ounce.
Zinc. Sulph.	2 ounces.
Spts. Vini et Camph.	4 ounces.
Boiling Water	1 quart.

When cool, to be shaken before using.

The diet should be laxative and unstimulating, quietude must be observed, and if the weather be hot, the animal should be kept in a cool place.

In the chronic form of gonorrhœa, it is usually necessary to cast the male, and draw the penis from the sheath. The organ should then be well bathed with tepid water, and the sores carefully dressed with lunar caustic. Fungoid growths must be removed with the knife, and the wounds afterwards dressed with caustic. In the female, a solution of caustic may be injected with a large glass syringe:

Nitrate of Silver	3 drachms.
Distilled Water	1 pint.

Cubebs and iron form the best medicinal treatment in this stage. 1 to 2 ounces of the former, with half an ounce of the latter (the sulphate) in a quart of cold water twice daily. Counter-irritation out-

side the sheath is often serviceable in obstinate male cases. When the os uteri is involved, it may be plugged with lint, saturated with the following lotion :

Tinct. Belladonna	1 ounce.
Chloride of Zinc.	2 ounces.
Distilled Water	1½ pint.

Sexual intercourse must be prohibited for fully a fortnight or three weeks after apparent recovery.

WARTS ON THE PENIS.

Not unfrequently bulls are troubled with fungoid or warty excrescences on the penis, which may be either the result of long-continued irritation from the previous disease, or from a constitutional tendency. They usually grow on the body of the penis near the end, but frequently they extend to the latter, preventing its exit from the sheath; or when out, its retraction in. The passage of urine is in such instances interfered with, finding its way through several outlets in the growth, which, in two cases coming under my own care, resembled a cauliflower, and necessitated amputation of the organ beyond the disease.

Treatment.—Removal: this may be done by excision, ligature, or caustic. In isolated warts, the two former are most advisable, and the application of caustic may follow if necessary. When the growth prevents the penis being withdrawn from the sheath, the latter may be slit open, and closed after the operation.

The animal should not be used for breeding purposes until completely well. Indeed, unless of valuable pedigree, where the growths are numerous and conglomerated, castration or slaughter would be the most advisable.

SCROTAL OEDEMA.

Oedema of the scrotum is occasionally met with in overworked bulls, but more particularly in those which are fat and in full habit of body.

Causes.—Plethoric condition of the scrotum, giving rise to congestion, swelling, and subsequent irritation. In overworked

animals, it arises from debility, and is easily produced by local injury.

Symptoms.—Heat, redness, swelling and pain. The latter is indicated by the animal curling the tail and stamping the hind-feet, and reluctance to have the part handled.

Treatment.—Suspension of the scrotum, warm fomentations and saline aperient. If the inflammation increases, the parts should be freely scarified and suspended in warm water, or leeches may be applied. Sloughing, which very rarely takes place, is best treated with zinc ointment and the occasional application of a weak solution of lunar caustic.

In all cases absolute rest is necessary, an unstimulating diet should be prescribed, and in the existence of plethora, a somewhat lowering one. In debility, tonics are called for. The sulphate of iron, in 4 drachm doses twice daily, will answer every purpose. When the animal is allowed to lie down, care should be taken that a good soft bed is underneath him.

ENLARGED TESTICLE.

This is usually the result of simple inflammation, arising from injury, as blows, bruises, crushes, etc. It may also be due to an excessive sexual demand, or from denial of connection when brought into contact with objects of desire.

Symptoms.—Enlarged testicle, unless of a chronic nature, and associated with induration, is attended with extreme sensibility, and the heat of the organ is felt through the scrotum; the latter, by reason of the increased size of the former, being frequently distended. Constitutional disturbance is more or less present.

Treatment.—If the enlargement is due to simple inflammatory action, antiphlogistic measures are indicated. Aperient medicine, local venesection, fomentations, and quietude. When arising from excessive sexual strain, rest and tonics are clearly demanded. While if from sexual desire, nature should, if possible, be allowed to follow her course; or relief by depletion from internal and local agents must be adopted.

In enlargement with induration, the iodide of potassium may beneficially be given. Dose, 2 to 3 drachms twice daily, or

combined with the same quantity of carbonate of ammonia and gentian.

OVARIAN TUMOURS.

"Ovarian tumours are of two kinds—*solid* and *cystic*. *Solid* ovarian tumours may be either *fibrous* or *cancerous*; the latter is most frequently colloid, and of a cystic rather than a solid character, rarely encephaloid.

"*Cystic* ovarian tumours comprise: *simple* cysts, with fluid contents, and single or multiple; *proliferous* cysts, having colloid contents, or solid growths. These varieties of cysts are less often met with independently, but as associated in the same tumour, which thus presents the characters of a compound tumour. The activity of proliferous tendency is an indication of the affinity of the tumour to cancer growth.

"*Dermoid* cysts are not included in the above forms of ovarian disease. These peculiar cysts contain all the appendages of the skin—hair, teeth, etc., and fatty secretion. Both ovaries are equally liable to cystic disease.

"*Diagnosis*.—Ovarian tumours must be distinguished from other abdominal tumours—from the gravid uterus in pregnancy, tumours of the uterus, omental tumours; ascites, hydatids, dropsy of the fallopian tubes; enlargements of the liver, kidney, spleen, and stomach; hysterical tympanitis, faecal accumulations, and distension of the bladder; abdominal and pelvic abscesses. The utmost care and caution must be taken in the diagnosis, before laying open the abdominal cavity for the removal of a supposed ovarian tumour, and then only discovering its real nature."—*Gant*.

Veterinary literature bears but scant record of this disease in the bovine species. The following cases are among the most noteworthy:

1. "A cow, about nine years old, was sent to the fattening pasture with a number of others, in the spring of 1848, and had gained a good deal of flesh; but as the fat market was very low, and the cow in calf, she was put back to be milked for another season. She remained in good health up to the 20th of January 1849, when she was suddenly affected with an enormous fluctuating tumour on one of the hind extremities. This tumour covered nearly the whole inside of the thigh, and extended from hip to hock on the outside, and contained above a large stable-pailful of fluid. No cause for this could

be assigned. By proper means the swelling was removed. In four weeks from this nothing more had occurred, and the animal continued apparently in good health until she was near her time for calving, with the exception that she appeared to be of an unusual size, measuring nine feet round the body over the loins; otherwise, everything else seemed in its normal state. After calving the size of the abdomen had but little subsided. She gave but a moderate quantity of milk, and remained in the same state until the spring, 1850, when she was turned again into the pasture for the purpose of fattening. This time, however, she did not improve, though her appetite and digestion seemed good. The proprietor again consulted F. Meyer, who, after a careful examination, could not discover anything amiss, with the exception of the enormous size of the abdomen (eight to ten feet in circumference), and a somewhat unthrifty coat, with a slight cough, although he examined her both *per anum et vulvam*. The *os uteri* was closed and soft.

"The owner had heard of a successful case of *paracentesis abdominis* performed by a colleague in the neighbourhood, and, fancying the case of his cow analogous, wished the operation to be tried, in spite of the absence of fluctuation. F. Meyer undertook the operation, although nothing could be expected from it. On the following day F. Meyer introduced the trochar near the *linea alba*, about a hand's-breadth behind the umbilicus. This was followed by the escape of about six ounces of fluid, of a yellow reddish colour, in a very feeble stream, which soon ceased. The canula was then removed, and the trochar plunged in again about a foot more to the left. This was followed by a similar result. The conclusion thereupon was, that if *ascites* was present, the fluid must be contained in a sac (*ascites saccatus*). The medical opinion was for slaughtering the cow, but eventually she was sent back to the pasture. On the 14th of July, F. Meyer was informed that the cow had been ill ever since the operation, and had lost her appetite. On examination, the pulse was found beating at the heart, and respiration was the same as before the operation. The visible mucous membranes were paler, particularly the conjunctiva. The animal was very dull, and lay down a great deal. The diagnosis was *peritonitis*, and the cow was killed the same day. The dissection shewed the cellular tissue of the left hind-leg to be the seat of the fluid extravasated. Tumour thicker and harder, while the small quantity of adipose matter was of a yellow colour. On opening the abdomen, about two stable-pailfuls of dark red-coloured serum escaped, in which large clots of coagulated blood were found, weighing from three to four pounds each. The peritoneum showed traces of inflammation, while an enormous irregularly shaped fleshy mass, covered by peritoneum, and unconnected with the abdominal muscles, partly of a dark and partly of a paler red colour, occupied such an extent of surface, that neither stomach nor intestines were visible.

"To remove this extraordinary formation, which extended from the pelvis to the posterior part of the sternum, it became necessary to raise the posterior part of the carcass, and, after making a section at the uterus and rectum, this enormous mass rolled out: the stomach, bowels, and other abdominal organs, appearing along the spine, reduced to about one-third of their natural size, through the pressure of this extraordinary formation. On examination it was found that the mass was the right ovarium. As it lay upon the ground it measured four feet in length, and three in breadth, and, on a section being made, one foot in diameter. Its weight was 250 pounds,

Cologne. In the centre was a large cavity subdivided into innumerable compartments, filled with dark clotted blood, which was estimated at about one-third of the weight. The broad ligament of the uterus was somewhat longer on the right side than on the left. The ovarian branch of the internal spermatic artery, which supplied the tumour with blood, had acquired the size of a large goose-quill, yet had preserved its serpentine figure. The left ovarium did not exceed the size of a large pigeon's egg. The uterus was contracted and empty. The digestive organs were so diminished, that the small intestines were not larger than a man's finger. The liver exhibited some yellow streaks upon its posterior surface. The gall-bladder contained about a quart of bile. The urinary and thoracic organs were normal."—*Magazin für die Gesamte Thierheilkunde, Berlin, 1851.*

2. "Early in the morning of the 8th of June, I was called upon by Mr. Hind, of this place, to go immediately to see a cow of his, which, he said, would not stand upon her fore-legs. Upon my arrival I found her lying very quiet, and looking about her as if nothing was the matter. The breathing was natural; pulse feeble, but nearly normal in character, nose moist, and eyes bright; extremities cold, and slight distension of rumen. I tried to make her move, when she raised herself on her hind-legs, but had not the slightest power in her fore-legs. The owner told me she had been on the common the day before as usual, and he expected she was within ten weeks of calving. He was informed that she was bellowing very loud, and had been galloping about the common a great deal, and then ran into the river. She seemed well when brought home last evening. He had her ever since she was a calf, and she was now about ten years old. Several calves had been bred from her, and she had never been ill before, although last year about this time after calving she ate the placental membranes. He was sure she had not done well since that, and sometimes she lost her milk, but it came again, and then did better for a time. She took the bull at her usual time after calving, and, as I have said before, the owner expected she was now within ten weeks of calving. He seemed confirmed in this idea by her losing her milk at the latter end of April. (On its return, a week before her death, as well as during her illness, he thought he could feel the calf, but great was his disappointment to find she was not in calf. I pronounced the case to be one of paralysis, arising from weakness and previous excitement, and treated her accordingly. She appeared to be getting better till the morning of the 11th, when I found her breathing to be very quick, the pulse accelerated and scarcely perceptible, the nose dry, eyes dull, and she looked behind her frequently. These symptoms I considered most unfavourable.

"Up to the night of the 10th she had been pretty quiet, but on this night there were signs of her having struggled violently, as if she had tried to get up, she having moved several yards from her old position. She died on the afternoon of the 11th, and when I called in the evening they had just commenced skinning her.

"*Post-mortem Appearances.*—Upon opening the abdomen a great quantity of blood escaped. The rumen was found full of dry food closely impacted; the mucous lining membrane was easily removed. The intestines were healthy and nearly empty. Whilst feeling amongst them I found the tumour met. I removed it without giving the subject any thought that it would be better to have let its attachment remain. It weighed 24 pounds. I then removed the uterus and bladder. On removing the hind extremities

I was very much surprised to find an effusion of blood had taken place, and there was a laceration of the muscles around the acetabulum joint. I continued my examination until I reached the os innominata, which was broken in several pieces. I can only describe the fracture by asking you to call to your imagination an entire os innominata, and then draw a line from before backwards, along the upper surface or sides of both of the obturator foramen, and that will leave the pelvic bone in the shape of an oval-bottomed scuttle with a tail to it. The ilium and acetabulum were perfect, but the tuberosities of the ischial bones were broken off. Altogether it was one of the most singular fractures I have ever met with or heard of.

"The contents of the thoracic cavity were perfectly healthy. All the principal veins were filled with the fibrinous portion of the blood and its colouring matter.

"I believe that the excitement upon a weak constitution first caused a suspension of the action of the rumen, or at least a partial suspension of its action, and then general paralysis resulted, as a consequence of greater weakness. The fracture I have not the slightest doubt took place during the night of the 10th, for up to this time the cow had been able to use her hind-legs, and to raise herself partially."

VAGINITIS.

Inflammation of the vagina is frequently met with in cattle.

Causes.—Occasionally it exists independently, but it more usually follows difficult and prolonged parturition, and more particularly in those cases necessitating the use of instruments for the extraction of the foetus. It may also occur from vicious injuries, as the thrusting of sticks, etc., within it, whilst on the other hand it is not an unusual accompaniment of uterine disease.

Symptoms.—When vaginitis exists independently it is denoted by a dirtyish-white discharge of mucus, which subsequently becomes purulent, unless, as is often the case, it spontaneously subsides; the mucous membrane is more or less reddened, and the constitutional disturbance varies according to the degree of inflammation. "In some instances, however, it assumes a troublesome, if not a grave character. When gangrene ensues we may have infective inflammation in the surrounding parts, and large portions of the membrane, or even the skin of the labia, may slough, while the discharge is sanious and foetid. Baumeister describes a diphtheritic form of vaginitis which he observed in a cow that had calved a few days before, and which died on the third day. At the autopsy, the vagina, as well as the uterus, was found full of pseudo-membranous productions. Another cow which stood beside

this one, and which had calved four weeks earlier, contracted the disease a few days after the cow that died, and also perished—leading to the supposition that this form of vaginitis is contagious.

"The *treatment* of simple vaginitis does not merit much consideration. Cleanliness, attention to diet, and injections of cold or tepid water, or mild astringents, into the vagina, generally succeed in subduing the inflammation. When, however, there is any tendency to acute inflammation and gangrene, or there exists ulceration, sloughing, or even abrasions, disinfecting treatment is advisable—a solution of carbonic acid (2 to 10 per cent.), permanganate of potass, or chlorinated or tar water, being perhaps the best local applications. General constitutional treatment may also be necessary, and especially if the fever runs high, and there are indications of septic infection."—*Fleming*.

Vaginitis, the result of local injury, is of far more serious import; the vulva is swollen, and the mucous membrane lining the walls of the passage is highly injected and exceedingly sensitive and of a high temperature. Micturition is frequent and painful, and violent straining is more or less present; the discharge from the vagina, at first thick and copious, becomes thin and acrid and offensive; the sympathetic fever is considerable and the animal rapidly loses flesh.

Medicinal treatment should consist in the administration of an aperient, followed in cases of acute pain with opiates and alkalies—diet unstimulating and relaxing. In the formation of abscess or chronic discharge, astringent injections and mineral tonics are indicated, with nutritive food.

INVERSION OF THE VAGINA.

Inversion of the vagina, or what is commonly known as "putting down the reed," is of frequent occurrence among cattle. It has been more generally observed in old cows, but the author has seen instances of it in young animals, especially fat stock, and in unimpregnated ones.

Causes.—Injuries, constipation, protracted parturition, fatigue from long travelling after parturition, abortion, placental retention, predisposition.

Symptoms.—The protrusion of a smooth, soft, red body at the orifice of the vagina distending the vulva. It is much more

prominent when the animal is in a recumbent position, and appears then much larger in volume. It may be pendent or otherwise. "In this respect it resembles inversion of the uterus, though the difference is otherwise very marked. In the majority of cases the tumour is most voluminous when the animal is lying, and can then be best examined. It is circular in form, varies in size from that of an apple to a large melon, and is not unlike a thick sausage; the surface is *smooth*, more or less of a deep red colour streaked with darker patches, and covered by a thick white mucus, or a fibrinous exudate; in other cases it is inflamed, excoriated by the tail or litter, and covered with foreign matters. *There are no traces of cotyledons or placental follicles.* On the under surface of the tumour is observed a longitudinal depression, or furrow, which leads to the urethra. At its end is a round opening, into which the finger can be passed as far as the os uteri, which will be found either completely closed or partially open. At the vulva the tumour is narrow, and exhibits longitudinal folds or ridges, due to the constriction caused by the vulva. Passing the finger between the tumour and the vulva, there is found a depression, or *cul-de-sac*, formed by its direct continuity with the vulvar mucous membrane. In certain cases the cervix uteri can be seen in the middle of the tumour."—*Fleming*.

In chronic cases the tumour or protrusion invariably remains persistent. There is difficulty in micturition, and occasionally febrile disturbance. Long exposure to air gives to the mucous membrane a somewhat leaden tint, and it becomes wrinkled and covered with epithelium of a leathery nature.

Treatment.—Having carefully cleansed the inverted portion, it should be returned by gradual pressure; if dry from exposure, a little oil or milk may be first poured over the surface. The after-treatment consists in the frequent application of cold water to the parts, the injection of mild astringents and the administration of agents that will impart tone to the system, as the preparations of iron and bark. In cases of recurring inversion a truss should be employed, or labial sutures; the latter are generally successful; some persons prefer a clamp. It is also advisable that the animal should stand with the hind parts elevated, which considerably facilitates retention. Lacerations require strict attention, otherwise adhesions are liable to take place, and a permanent inversion

be the result; in such instances amputation of the protruded organ has been necessitated, and practised with success.

The diet should be plain, unstimulating, and nutritious; moderate exercise daily is beneficial, as the protrusion is not so liable to occur in the standing posture and during locomotion, as in the recumbent position. Constipation, or any of the causes which give rise to straining, must be avoided.

POLYPUS IN THE VAGINA.

Tumours, or polypi, in the vagina are not unfrequent in the cow. They are generally situated some distance from the orifice, and are attached to the mucous membrane of the vagina by a very narrow peduncle, or stalk. The tumour is usually observed when the animal is lying down; sometimes it increases so much in size as to be continually protruded. The *polypes à pendule* of the French, vaginal polypus, may be confounded with uterine inversion but a careful examination will at once remove this doubt, as its attachment can generally be felt.

Symptoms.—The tumour is usually pear-shaped, and attached, as already remarked, by a narrow stalk. It is usually of a fibrous nature, smooth, glistening, movable, and insensible when manipulated. It is attended with a large secretion of mucus, and not unfrequently a purulent discharge. Micturition is performed with more or less difficulty, and when the tumour is large it also interferes with the evacuation of feces.

Treatment.—This consists in its removal, which may be effected in various ways. That by excision or ligature is, in my opinion, preferable, and in the cow is attended with but little danger or constitutional disturbance. Astringent injections may afterwards be used, with the occasional application of lunar caustic if unhealthy action or fungus results.

VESICO-VAGINAL FISTULA.

"When the floor of the vagina is ruptured, it may happen that the neck or walls of the bladder are involved in the lesion, just as that viscus may, as we have seen, become prolapsed or hernied

through the vaginal rent. When rupture of the bladder occurs in this manner, the case is indeed serious. The urine is no longer confined to its receptacle, but escapes through the laceration and becomes infiltrated in the pelvic connective tissue. Hence arises most serious complications—pelvic cellulitis and *urine-abscess*, which rapidly lead to a fatal termination. In less formidable cases the urine may escape by the vagina, but involuntarily; so that the incontinence of urine not only proves a troublesome infirmity, but the constant passage of this fluid over the membrane lining the vagina gives rise to intense inflammation of the canal, and leads to the formation of a vesico-vaginal fistula. This fistula may also be produced by usure or bruising. When the foetus is very large it occasions over-stretching of the vagina, and if it remains for any length of time in the passage, this distension weakens the vitality of the soft tissues; so that the compression to which they are submitted between the foetus and the floor of the pelvis will produce mortification, which may extend to the neck of the bladder. The resulting sloughing, should the animal survive, will establish a direct communication between the vagina and bladder.

"An animal may live with a fistula of this description, provided urine-abscess, uræmia, or other serious complications do not result.

"The *symptoms* need not be specified. The chief is incontinence of urine. When this fluid is observed to be constantly dribbling from the vulva after parturition, the existence of the accident may be suspected, and an examination per vaginam will confirm the suspicion.

"*Treatment* must be mainly palliative."—*Fleming*.

Dupont ("Recueil de Méd. Vétérinaire," 1858, p. 1057) examined a fine, well-bred, four-year-old cow, which was in good condition. The animal emitted a very penetrating acid odour, which extended to some distance around it. The tail was entirely denuded of hair; a vast ulcer occupied all the posterior regions, from the inferior commissure of the vulva down to the claws of the hind feet. After washing the parts well with chlorinated water, the hand was passed into the vagina, and a large wound was discovered in the middle of the lower and posterior part of that canal; but it was partly concealed by large, ragged, and irregular vegetations. Pus, thick and plastic secretions, and a thin layer of salts, gave to the

touch the sensation of a calcareous powder occupying the bottom of the wound, which was bathed by a permanent "sweating" of urine. When this part of the vagina had been well cleansed, it was observed that there was a considerable loss of substance, and that about three inches of the ischial symphysis was denuded. The irregular borders of what remained of the vagina stood nearly an inch above the bony surface; great, movable, and spongy granulations partly covered the symphysis, and appeared to be the seat of an abundant suppuration. Beyond this the retracted bladder could be felt. The vaginal mucous membrane was of a bright-red colour, and the whole of its inferior surface was ulcerated. The place where the hind-feet of the animal had stood during the few minutes' exploration was saturated with urine.

No information as to the date or origin of the lesion could be procured.

On the 4th of January in the present year, the following case in a ewe came under the notice of Mr. J. T. Phillips, M.R.C.V.S., my assistant. A protrusion from the vagina was observed by the shepherd, but when Mr. P. arrived, several feet of intestine, together with the bladder, had found their way through the floor of the vagina. The animal was slaughtered and a post-mortem examination made, revealing a large vaginal rupture. Labour had commenced with twin lambs; both were dead. The accident was no doubt the result of straining.

According to Gant, in human surgery, the requisite operation consists in completely paring the edges of the vaginal aspect of the fistula, and then uniting them by suture. In paring the edges, it is necessary thoroughly to denude every part; for if the smallest portion of mucous membrane be left, it may prevent union. None of the mucous membrane of the bladder must be removed. The wound should present a bevelled oblique line, slanting from a large vaginal opening to a smaller vesical one. The denudation being complete and free, sutures are next to be introduced. These should be passed obliquely from at least a third of an inch outside the edge of the incision. They must not include the mucous membrane of the bladder. The tightening and tying of wire sutures is easily accomplished by the fingers. Care must be taken not to pull them too tight, so as to invert the edge of the vaginal mucous membrane. He recommends, as after-treatment, a gum-elastic

catheter retained unplugged, that the urine may continuously drain out of the bladder; the instrument to be constantly watched, cleansed, and re-introduced twice a day. He further remarks; "It is of the utmost consequence to prevent the action of the bowels for at least a week; and this may be accomplished by administering a full dose of opium soon after the operation, and maintaining its influence subsequently by small doses." In the cow, however, such protracted constipation or peristaltic suspension would hardly be practicable.

THROMBUS OF THE VAGINA AND VULVA.

This, like the preceding lesion, is usually a parturient accident, and "is due to an infiltration of blood into the connective tissue of these parts, from the almost inevitable injury they sustain during laborious parturition.

"In such cases, when the fœtus is very large, or in a wrong position, considerable manipulation and traction are often necessary to adjust and remove it; and this leads to bruising of the soft parts against the pelvis, and laceration and rupture of the bloodvessels and connective tissue. The bloodvessels are larger, and probably more numerous, during pregnancy than at other times; consequently there results extravasation of blood and considerable tumefaction of the genital canal, particularly in the vagina and vulva. Sometimes this tumefaction appears during parturition, when it may form an obstacle to birth.

"The mucous membrane is raised into irregular masses, perceptible to the eye, and still more marked to the touch. The membrane itself has a blue, violet, or black tint; the labia of the vulva are considerably swollen, and the engorgement may extend to the thighs and croup.

"If there is not much extravasation, the effused blood may be absorbed in a few days; but if the thrombus is extensive, the blood becomes decomposed, gives rise to inflammation, may run on to gangrene, and septic infection may consequently ensue.

"As to treatment, scarifications are above all things to be recommended.

"Samson, who has had much experience of such cases, says that the labia of the vulva should be well separated, and a bistoury

plunged into the right and left walls of the vagina, as if to open an abscess, and the incision should be large, in proportion to the quantity and situation of the clots; pressure must then be made so as to remove the latter.

"The operation appears to be quite innocuous; though a case is recorded by Cartwright (*Veterinarian*, vol. xix. p. 386) in which a great stream of blood issued from one of the punctures, in consequence of a large vein being wounded.

"When all the extravasated blood has been removed from beneath the mucous membrane or skin, cold-water injections and sponging, and weak solutions of carbolic acid, permanganate of potash, or other detergent and disinfectant fluids, should be resorted to. The same treatment is to be adopted when suppuration has set in, only more attention must be paid to the disinfectant treatment."—*Fleming*.

LACERATION AND RUPTURE OF THE VAGINA.

Laceration and rupture of the vagina may take place from various causes. In the cow they are usually due to malicious injury, or associated with parturition. The injury may be *spontaneous* or *accidental*. When occurring spontaneously, "it happens either that the vagina is lacerated along with the uterus, during natural labour, and from continuity of texture, or when the os is amply dilated, but the vagina is over-stretched by the fetus.

"In some cases such an accident as rupture of the vagina may be secondary; as when the textures which form its walls are much bruised and contused during the passage of the fetus. Then gangrene may supervene, and the mortified tissue be thrown off in a gradual manner, until complete perforation has taken place.

"With regard to rupture of the vagina, and particularly that which may be designated 'spontaneous,' it may be remarked that when the lesion occurs towards the cervix uteri, it is nearly always transversal, and, as has been before noted, the vagina may be completely separated from the uterus. In other instances, the form and direction of the rupture will differ considerably. Longitudinal rents often extend into the cervix uteri and body of the uterus."—*Fleming*.

When laceration and rupture of the vagina occur accidentally,

they are usually produced during protracted labour, and where assistance is had recourse to, and especially in the employment of instruments. The feet of the fœtus are a frequent cause of such injuries, as also exposed bones in delivery by dissection. An abnormal condition of the pelvis may likewise lead to rupture.

Lacerations of the vagina are always more or less serious, but complete rupture is especially so; and it is very essential a careful diagnosis and thorough investigation into the probable cause should be made by the attendant veterinary surgeon, otherwise unpleasantness, if not litigation and a compromise of position, may result. Very recently I gave scientific evidence in a case of this kind, where the prosecutor endeavoured to prove the laceration and rupture were the result of carelessness on the part of the accoucheur, but which in my opinion, on the evidence adduced, had occurred before assistance was rendered, and was due to the expulsive efforts of the mother, and her obese condition. A verdict was given for the defendant, who nevertheless was caused much annoyance and expense.

Among the complications of vaginal laceration and rupture may be mentioned *hæmorrhage, inflammation, suppuration, fistula, septic infection, hernia of the intestine, hernia of the bladder peritonitis, and perineal injury.*

Treatment.—This will depend upon circumstances. "When rupture of the vagina is recognised during parturition, delivery should be effected as speedily as possible, and with every care, in order to prevent the laceration extending, and the fœtus passing into it. If, unfortunately, some part of the latter has lodged in the rent, it must be removed therefrom with the utmost precaution, so as not to injure other viscera. The fœtal membranes should also be extracted as soon as possible. If there is hæmorrhage from the vagina, this may be suppressed with ice or injections of cold water if the rent is superior or lateral; if it is inferior, then a sponge or a cloth soaked in cold water should be placed in the canal. Should there be hernia of the bladder or intestines, these must be replaced at once.

"In all cases of wounds, abrasions, or rupture of the vagina, every precaution should be observed with a view to the prevention of septic infection. With this object the greatest cleanliness must be observed; all decomposing matters or matters likely to decompose

should, if possible, be scrupulously removed, and injections or 'swabbings,' with weak solutions of carbolic acid or other disinfectants, practised. If there is much danger of hæmorrhage, a suitable tampon of lint or fine tow, saturated in these fluids, may be allowed to remain in the vagina for some time."—*Fleming*.

I have found astringents exceedingly useful, and none more so than tincture of iron poured upon a large pledget of tow, and placed at the seat of hæmorrhage. Aromatic infusions and acetate of lead have found favour with some authorities.* Opiates are also useful to allay pain and straining. To obviate constipation linseed oil may be given.

LEUCORRHEA.

This disease, commonly known as the "whites," is a chronic discharge from the vagina and womb, usually of a white, flaky (sometimes ropy), glutinous, and inodorous character. At times it is muco-purulent, of a rusty colour, and offensive.

Causes.—Debility, stimulating food, uterine excitement, polypus, prolonged irritation of the genitals; hence its frequent appearance after inflammation of the vagina and uterus, and occasionally it is associated with scrofula.

Symptoms.—In addition to the character of the discharge already named, the mucous membrane lining the vagina is pale and flaccid; in other instances, where the discharge has been of some duration, the mucous membrane is rough and thickened, or red and inflamed; and constriction of the vaginal passage has been known to accompany this condition. In the first stage, there is little or no constitutional disturbance, and the appetite is unim-

* Petzold ("Sachsen Jahresbericht," 1865, p. 73) relates that a cow was delivered of its calf by manual force, though without much difficulty; nevertheless, there ensued much swelling of the vulva, which extended to the right hock. On a close inspection being made, there was found on the right side of the vagina, about four inches from the vulva, a rent nearly three inches in length, while the whole of the vagina itself was swollen, hard, and of a bluish-red hue. Fæces and urine were voided with difficulty; the animal was feverish, had lost its appetite, the respiration was hurried, etc. Injections of tepid aromatic infusions, with acetate of lead, were resorted to. From the third day all the more serious symptoms disappeared, and on the tenth day the wound had healed.—*Fleming's "Veterinary Obstetrics."*

paired ; but as the disease proceeds, and the character of the early discharge becomes altered, then an amount of sympathetic fever is manifested, the pulse is quickened, the appetite fails, the animal sinks in condition, the secretion of milk is diminished, and the bowels are irregular.

Animals so affected are frequently in œstrum, but uncertain as to breeding ; or if they do become pregnant, they very often abort.

Treatment.—In the early stages, cleanliness, frequent injections of tepid water, and weak solutions of alum or zinc. A drachm of either to a quart of water, and the administration of a saline aperient, with a plain laxative diet, will frequently restore the patient to health.

In chronic cases, stronger measures are needed. A solution of tannic acid, sulphate of iron, or the alum and zinc in stronger proportions, should be injected. Tannic acid is, in my opinion, the most beneficial agent in these cases. Half an ounce to half a gallon of tepid water used three times a day, having previously well syringed the parts out with plain water ; or if the discharge be offensive, carbolic acid, 1 to 40, may be first injected, and followed by the tannic acid. Opiate injection may from time to time, when there is considerable irritability, be used with advantage.

Medicinally small doses of copaiba are beneficial ; and the mineral tonics, iron notably, should be administered. The diet should be generous, laxative, and unstimulating.

In obstinate cases of leucorrhœa, painting the perineum with strong tincture of iodine daily, until sufficient counter-irritation is obtained, will be found serviceable.

ABORTION.

Abortion, by which is meant the expulsion of the contents of the womb before the full period of utero-gestation, is unfortunately of frequent occurrence in the bovine species. Abortion usually takes place during the first half of pregnancy, and is then considered less dangerous than at a more advanced time. Owing, however, to the variableness of the pregnant period in these animals, the date at which it may be correctly termed abortion has no definite fixtue. Fleming* limits it to within thirty-five

* Fleming's "Veterinary Obstetrics."

days from the normal period. Saint-Cyr takes it up to the two-hundredth day. For my own part, I should term it an abortion under seven months, and after that date a premature birth; as in the latter case, though small and puny, the offspring may live and thrive, while in the former it is usually either still-born or speedily succumbs. As Fleming, however, remarks: "In practice, there is no accurately defined limit between abortion and premature birth, and especially when the latter has been brought about by some of the causes which produce the former."

Abortion in cattle is generally *sporadic* or *accidental*, but from time to time it assumes an epizootic form.

Causes.—These may be divided into external and internal; and again, into immediate, predisposing, and exciting.

The external causes are those due to atmospherical influences, defective hygiene, and various accidents.

The internal causes arise from disease, malformations, and malpositions.

The immediate cause of abortion is uterine contraction.

The predisposing causes may be enumerated as follows: Previous abortion, hereditary disposition, uterine disease, and various internal disorders, especially those in which the nervous system is implicated; a disproportionate male, or of feeble sexual power; the transmission of disease from mother to foetus, as in the case of contagious pleuro-pneumonia,* an instance of which has just come under my own observation; diseases of the foetus or its membranes; excessive volume, or plurality; an extremely plethoric, obese, or anæmic condition of the parent, are also predisposing causes of abortion.

Exciting Causes.—These are sudden changes of temperature, coarse, indigestible, and acrid food, especially that which is liable to ferment.† An overabundance of too stimulating food, large

* Barrier describes an abortion epizooty among cows, in which nearly all the calves were expelled alive at the fifth to the seventh month, but died within eight days afterwards. The principal symptoms were a more or less loud rale, the discharge of rusty-coloured mucus from the nostrils, and constant loud bellowings. At the autopsies the "lungs were tumefied, red, and fleshy, and the bronchia filled with the saffron-tinted fluid that flowed from the nostrils."

† Delwart has given a good illustration of this: "For twenty years all the cows in a herd of thirty aborted each year, and if by chance one calf reached its term, it was so puny and deformed that it died in a few days

draughts of cold water when the system is heated, impure water, partaking of various plants or their administration, notably the horse-tails, sedges, hellebore, savin, rue, ergot of rye;* the incautious use medicinally and externally of cantharides and turpentine, as also drastic purgatives. Undue exertion, chasing, fatigue, long fasts, frights, external violence, as blows, kicks, or falls on the abdomen, crushes, vaginal penetration, operations, etc. Peculiar odours are also said to excite abortion, especially that arising from the act itself; non-pregnant animals even being excited by its effluvia.

Symptoms.—As a rule, abortion takes place so suddenly that no premonitory symptoms are observed, and this is especially the case in the early period of pregnancy. Indeed, often so quickly is the act accomplished, that the animal appearing in its usual health and spirits may be very shortly afterwards minus its fetus, and with little or any constitutional disturbance; thus presenting a wide contrast to the same event in a human being. Neither is any affection displayed toward the premature offspring. As Saint-Cyr justly remarks: "Even the sentiment of maternity, which is so strongly developed in animals, is not awakened in favour of the expelled fetus, and the mother shows the utmost indifference to it, even treading on it as if it were in no way related to her."

If the abortion has recently taken place, an alteration, depending in degree on the proportions of the fetus, will be observed in the shape of the animal; the abdomen will be more pendulous, the flanks drawn in, and enlargement of the external generative organs, with a glutinous discharge from the vagina.

after birth. The cause of these abortions appeared to me to lie in the too large quantity of grains and balls of cereals with which the animals were fed; the rumen and second compartment of the stomach formed a compact mass which weighed on the fetus, prevented its development, and ended by killing it. These cows were put under our care, and submitted to a different kind of alimentation; roots replaced the innutritious food previously given, and which gave rise to permanent indigestion. This regimen was seconded by the administration of a decoction of linseed, five or six bucketfuls in the day, and a draught of a pound of sodium sulphate to each cow. . . Success was complete; the destructive scourge entirely disappeared, and twenty-eight healthy calves were born at the proper time."

* Haselbach reports that in a cowshed where maize infested with its parasitic fungus (*Ustilago maidis*) was given to the cattle, eleven aborted within eight days. The food was changed at once, and the other cows escaped the accident.

In complicated or laborious abortion, the symptoms are very similar to those in parturition, with the exception that the change in the animal is very sudden, and the dejection is extreme.

Results.—Abortion is always attended with serious results. In the first place, there is the loss of the offspring. Second: If the accident happens in the early period of pregnancy, the lacteal secretion is arrested, and does not become restored until after the next pregnancy; while the animal herself may be seriously injured. Excessive hemorrhage, or even rupture of the uterus, sometimes results from abortion; or retention of the fetal membranes, followed by putrid infection, is not unfrequently a concomitant. Again, the period of œstrum is often interfered with, sometimes not returning until what should have been the normal period of pregnancy has elapsed. Add to which, a vexatious result lies in the fact that an excitable condition of the generative organs often remains for some time afterwards, which may result in persistent œstrum, nymphomania, or sterility, or, if conception takes place, in repeated abortions.

Where an abortion is supposed to have taken place, at pasture, or under circumstances where no fœtus is to be found, a careful examination of the animal should be made. Usually the mammary gland is altered in character, being more or less tumid, hard, and painful. The hair of the tail is wet with blood, mucus, and placental fluid, and has the smell peculiar to the uterine fluids in parturition. The vulva is swollen and dilated, and its mucous membrane is injected, and not unfrequently bruised. Examination per vaginam will discover the passage relaxed, the os uteri soft and open, and in the uterine cavity—if it can be penetrated—may be found fluid, and remnants of fetal membranes.

Treatment.—In those cases where abortion has occurred in the early period of pregnancy, and followed by little or no constitutional disturbance, but little active treatment is required; removal from the pasture, if out of doors, to the building, the administration of saline medicine, followed by mineral tonics and good food, will usually fulfil the medical treatment. Under all circumstances the cow should be completely isolated from its companions, or at all events from pregnant cattle, and the excreta, manure, etc., carefully removed and destroyed.

In later abortion stronger measures are carefully required, the

constitutional disturbance being greater, and complication often arising. Hæmorrhage must be treated under the head of "vaginal or uterine hæmorrhage." If the placental membranes have not been discharged, they should be removed without delay by the hand, and Fleming suggests the subsequent injection of a weak solution of carbolic acid, permanganate of potass, or salicylic acid.

Mineral tonics, diffusible stimulants, and nourishing food, with warmth if the weather is cold, are also to be prescribed.

Preventive Measures.—These consist in avoiding, so far as possible, the causes giving rise to abortion. Mouldy or ergotised food should not be allowed; in the event of the latter being partaken of, Zundel recommends the internal administration of carbolic acid. Thorough cleanliness and disinfection should be resorted to whenever an abortion occurs in a shed or building, and its sanitary arrangements made as complete as possible. Everything connected with the abortion should be effectually removed and disposed of, viz. fetus, membranes, discharges, excreta, manure, litter, etc.

RETENTION OF THE PLACENTA.

This, as already observed, may be associated with abortion; but here it will be dwelt upon as following the full term of pregnancy.

After the birth of the offspring the next uterine function is the expulsion of the fetal envelopes. The time of this act varies in the cow considerably; in some instances it follows in a few minutes after parturition, in others in as many hours; while again it not unfrequently happens that some days, occasionally reaching a fortnight, may elapse before these membranes are expelled. This long and varied retention in the cow is undoubtedly due to the cotyledonal arrangements, which are exceedingly numerous and large.

Causes.—In addition to the anatomical arrangement just mentioned, we have to look to other conditions favouring placental retention. Some authorities have stated that it usually follows protracted and difficult parturition; others, that it is more generally a sequel of a quick and easy birth. My own experience attaches me to the former view. Old cows more frequently retain their placenta than young ones. Morbid adhesion between the placenta

and uterine surface is not an unfrequent cause of prolonged retention, and I need scarcely remark that any such abnormal organization renders a forcible removal dangerous. Extreme contraction of the cervix uteri and consequent closure of the os may also prevent expulsion of the membranes. Contraction also may exist with morbid adhesion, rendering the case still more complicated.*

Symptoms.—These in the cow are usually manifested by a portion of the membranes protruding externally, but in the absence of such protrusion there is more or less uneasiness, denoted by stamping or shuffling with the hind-feet, curling and whisking the tail, continually making efforts to urinate or void fæces. When putrefaction has commenced, a dirty sanious and most offensive discharge issues from the vulva, often mingled with large shreds of the decomposed membrane; the thighs and hocks are excoriated by it, and this creates still more uneasiness. At this period constitutional disturbance is observed, the animal is dull and dejected, the appetite is small or lost, the respirations are hastened, the temperature increased, and the secretions, particularly the lacteal, are more or less suspended. The complications seen in other animals, more especially the mare, as septikæmia, metritis, metro-peritonitis, vaginitis, leucorrhœa, trismus, tetanus, and other affections, are fortunately rarely seen in the cow; nevertheless, it behoves to take every precaution against such events, and when they occur, to adopt prompt and wisely ordered remedies.

Treatment.—It is quite true that the cow frequently does retain her placental membranes for a long period without any apparent harm, and it is owing to this fact that Nature's admirers are apt to let their enthusiasm carry them to extremes, and induce them to take no steps for her assistance. Now, whatever Nature may be capable of, it is quite certain this condition is contrary to her laws; and were she able she would not allow an offending matter to remain to her injury a moment beyond its natural period. So soon as the young animal has a separate existence from its mother, the

* "When called upon to separate an adherent placenta, we may find the uterus flabby and uncontracted, or it may have embraced the mass more or less tightly. It is most usual for a contracted state to exist in conjunction with morbid adhesion, because the probability is that the organ will have made some abortive efforts to expel it, and not being able to protrude it from its cavity, will have closed upon it."—Dr. Ramsbotham, "Obstetric Medicine and Surgery."

envelopes which previously enclosed it become a foreign body. Regarding, however, man's interference, much depends upon existing circumstances as to whether serious symptoms or otherwise are presented.

Fleming observes: "When parturition has been normal, when the cow does not appear to suffer pain or inconvenience, when the 'straining' is unfrequent and slight, the appetite good, and lactation established, and particularly when, during a low or moderate temperature, a portion of the membranes protrude beyond the vulva, then there is no great reason for interference until a week or even more has elapsed. But if, on the contrary, the external temperature is high, the labour has been difficult, the genital organs irritated or abraded, and if fever, restlessness, and suffering are noted, with strong and frequent straining, and especially if there are foul-smelling discharges from the vagina, then intervention is called for, no matter whether the time which has elapsed since parturition is long or short."

DROPSY OF THE PLACENTA.

Hydrops Amnii, or excessive secretion of fluid in the amnion, is a condition met with sometimes in the cow. It is usually apparent about the fifth or sixth month of pregnancy. Saint-Cyr and Gierer, among others, have recorded several interesting cases; the latter remarks that it is most frequently met with in poor, badly-fed animals, and particularly in cows in which improper hygiene has produced a morbid excitement of the generative organs, the result of which is that the act of exosmose and endosmose does not take place equally through the walls of the placenta and placentulae. A division of opinion has existed as to whether this form of dropsy belongs to the maternal or the foetal, but it is now generally considered a disease of the foetus and its appendages.

Symptoms.—"The abdomen rapidly enlarges, especially to one side—generally the right; and in a short time it has acquired a greater volume than it has towards the end of gestation. At this period the health becomes deranged, and colic, with or without tympanitis, is not unfrequent. General debility is so marked that the animal can scarcely, if at all, stand; the appetite is lost,

rumination is suspended, defecation and micturition are irregular, œdematous swellings of the limbs and abdomen ensue, with dyspnœa, which increases so quickly in intensity that asphyxia is often imminent. The muscular parietes of the abdomen have in some cases been ruptured, and the entire mass of the uterus, with its contents, has formed a subcutaneous hernia. The ordinary period of gestation may be completed, or abortion may occur at the seventh or eighth month, when all the indications of such an occurrence are present. The uterine contractions, owing to the relaxed condition of this organ and its distended and paralyzed fibres, are weak, the pains feeble and unsustained, the os does not dilate, and the act of parturition is consequently tedious."—

Fleming.

An examination per rectum and vagina materially aids the diagnosis—the uterus is felt to be an immense size. Vaginal exploration reveals the organ to be bulged as it were into the vagina, to contain an unusual amount of fluid, and an inability to detect the presence of a fœtus. Occasionally the os is dilated, with protrusion of the fœtal membranes.

Treatment.—The fluid may be evacuated either by rupturing the membranes with the fingers, or by the introduction of a trochar and canula. If expulsion of the fœtus does not shortly follow the emission of fluid, delivery should be accomplished in the usual manner.

INFLAMMATION OF THE UTERUS.

Inflammation of the uterus (metritis) may occur as an independent affection, or the inflammatory action may extend to its peritoneal covering, and constitute what is termed metro-peritonitis.

Causes.—Inflammation of the uterus is generally associated with parturition, particularly if the labour be protracted, and unskilful or rough usage has been had recourse to. Retention of placental membranes has also been noticed as an exciting cause. It may proceed from external violence, or from the use of injudicious and excessive vaginal injections, otherwise in the unimpregnated womb it is a rare occurrence.

Symptoms.—It is usually ushered in with rigors. There is pain on pressure over the uterine region, and also on examination per

vagina; in the latter, the os uteri will be found exceedingly sensitive and hot. There is also more or less tumefaction and heat of the vulva, and sometimes a discharge, at first clear, and subsequently purulent and offensive, issues from the vagina. Associated with these conditions, there is fulness of the abdomen and general inflammatory fever, denoted by a high temperature, a quick small pulse, and increased breathing. The animal is prostrate, but afraid to lie down, grinds its teeth, stamps, strikes at the belly, curls the tail, and looks from time to time towards the flanks, and frequently endeavours to urinate. If metritis occurs at, or after parturition, the secretion of milk is generally suspended, the bowels are constipated, and the evacuation of feces attended with pain. Very often the rumen is distended with gas. When the inflammation extends to the peritoneum, the pain is more diffused, peritonitic symptoms are manifested, and generally a rapid effusion of fluid into the abdominal cavity takes place. In such a case the abdomen becomes considerably enlarged, there is dulness on percussion, and the presence of fluid can be detected by pressure with one hand, whilst the other is placed flatwise at another point.

Treatment.—The attendant should first ascertain the condition of the uterus, and if this organ or the vagina contain any infective matters they should be at once removed, and any wounds or abrasions disinfected.

Fleming recommends thorough cleansing of the genital canal by injections of warm water, and dressing the wounds with carbolic acid and olive oil (1 to 10), applied by means of a feather or brush; or salicylic acid 1 part, spirits of wine 20 parts, warm water 24 parts. After cleansing the uterus, the daily injection of carbolic acid solution (1 to 20-50), and the wounds, if accessible, dressed at the same time. When the disease is less acute he prescribes as a genital injection permanganate of potash (1-50 of water).

ULCERATION OF THE UTERUS.

This condition of the uterus may proceed from injuries, foreign bodies, as the retention of a foetus, or be merely the result of congestion or inflammation of the organ.

Symptoms.—Occasional straining, thick muco-purulent discharge, frequent micturition, loss of appetite, irregular action of the bowels, with lassitude and more or less febrile disturbance. Sexual desire is not unfrequent, especially in the early stages of the ulcerative process. If the disease extends, the emaciation is rapid, and all the local symptoms are aggravated. In milch cows the lacteal secretion is more or less suspended.

Treatment.—Astringent injections, as alum or zinc, night and morning. Tonics (particularly the preparations of iron), a nourishing and liberal diet, cleanliness. Carbonic acid solutions, 1 to 40-50, are serviceable when the discharge is offensive and profuse. Sexual intercourse should be prohibited.

CANCER OF THE UTERUS.

Uterine cancer is, fortunately, in the bovine species, not a frequent disease.

Symptoms.—In the early stage there is more or less hæmorrhage, which is sudden in its appearance, and accompanied by pain and straining. As the disease advances, and when the ulcerative stage is reached, there is a continuous discharge of a thin, dirty, greenish colour, highly offensive, and from time to time stained with blood. When the labia uteri and cervix are involved, manipulation with the fingers causes instant bleeding. A considerable amount of constitutional disturbance is always present, indicated by suspended rumination and lacteal secretions, loss of appetite, frequent eructations, vomiting and tympany, irregular bowels, excessive micturition from uterine and vaginal irritation. Rapid emaciation also accompanies the disease.

Treatment.—Mineral tonics, cod-liver oil and nutritious diet; sedative enemas and subcutaneous injections of morphia for the relief of pain; astringent injections for the suppression of hæmorrhage; carbolic acid or chloride of zinc injections to counteract offensive odours in the discharges; or the removal of the disease *en masse* by excision of the uterus, are the various measures prescribed. From, however, the unsatisfactory nature of the malady and its usual fatality, when a correct diagnosis has been made,

slaughter is the best policy ; but on no account should the carcase be used for food purposes.

INVERSION OF THE UTERUS.

This is a very common accident in the cow, and is commonly known as "*Falling down of the calf-bed.*" The inversion may be partial or complete ; *i.e.*, the protrusion may be limited in volume, or the entire uterus may be literally inverted, or, to use a more common expression, turned inside out.

Such an accident may be simple or complicated. Simple, when uninjured, and the displacement confined alone to itself ; complicated, when lacerated, twisted, and accompanied by displacement or injury of other organs.

Causes.—Inversion of the uterus is usually a sequel of parturition, particularly if the labour has been protracted, difficult, and undue force has been used. In some animals a predisposition to uterine inversion occurs, and among conditions favourable to such an event may be mentioned previous inversion, flaccid uterus, relaxed os and weak cervix, relaxed uterine ligaments, general excitement and constipation. Debility, from badly got and innutritious food, is another predisposing cause of this accident, which has been proved by its frequent occurrence after the use of wet damaged crops.

Treatment.—This consists in returning the uterus to its proper situation, which should be effected as quickly as possible, otherwise its swollen and abnormal condition will render the operation next to impossible. Before replacement, all extraneous matters should be carefully removed with warm water, or milk and water. If any portion of the foetal membranes are adherent, or ragged fragments of mucous membrane, their removal is also indicated ; while in partial or complete ruptures of the organ, such wounds should be closed by continuous catgut sutures, not too tightly drawn. These measures having been adopted, the uterus (if unaccompanied by any other hernia, in which case the latter must be first dealt with) being supported with a cloth held by assistants, its return is attempted as follows : The closed hand being placed at the centre of the protruded organ, gradual but powerful pressure is brought to bear on the inverted mass. When its partial return into the vagina has been accomplished, before

withdrawing the hand a second part of the viscus may by an assistant be gathered in at the side and propelled in like manner; and so each step may be effected gradually and progressively. During straining, the hand and arm should be firmly held as far as possible in the position it has reached, otherwise the whole business will have to be recommenced.

In my own practice I always employ a staff—usually a broom-handle, with the end to be applied to the fundus well padded. Such an instrument gives greater power, and may be manipulated by more than one pair of hands.

Previous to returning the uterus, and afterwards, it is advisable to place the animal on ground elevated behind, so that the hind-quarters may be higher than the fore, thus favouring the return of the organ and its retention, and also rendering the position of the patient less favourable to straining and expulsion.

When straining continues after the operation has been accomplished, or even during it, the administration of a sedative is advisable: hydrate of chloral, opium, or the subcutaneous injection of morphia may be employed.

Towards the same object various surgical measures are adopted, as pessaries, labial sutures, clamps, and trusses. Either the labial sutures or trusses are the most convenient for general use. Regarding the former, I have always employed broad tape, taking a deep hold, and tying them in bows so that they may be readily undone or relaxed when necessary.

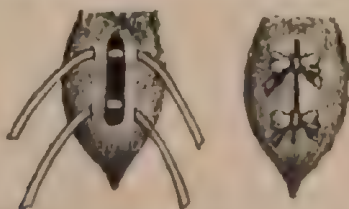


Fig. 55.—Labial Sutures of tape inserted.

Fig. 56.—Labial Sutures of tape tied.—Original.

Figs. 55 and 56. I have never as yet found it imperative or more advantageous to employ the *hip suture*.

Among the several kinds of truss in use may be mentioned, as the most useful, Delwart's, Renault's, and Lund's.

"Delwart's truss is formed by cords united by a loop in their middle, in such a manner that an oval space (*a*, Fig. 57) sufficient to admit the vulva, and compress it laterally, is formed—the inferior commissure being left free, to allow the escape of urine, and uterine discharges, should there be any. The two portions of one of the cords (*bb*, Fig. 57) passing over the back, are secured to a collar or band round the neck or chest; while those of the other

cord (cc) pass between the thighs, and are tied to the lower part of the collar or surcingle, in the manner depicted in Fig. 58. The loop may be wrapped in tow or cloth, to prevent chafing to the parts under the tail."—*Fleming*.

"Renault's truss is composed of a leather strap which buckles round the neck, and a rope from twenty-four to thirty feet long, and the thickness of the little finger, or a trifle less, according to the size of the animal.

"The neck-strap is not indispensable, though it is useful in giving more firmness to the truss. In order to apply the bandage the neck-strap or collar is first to be put on; the cord is then to be doubled in equal parts, and put across the back, behind the withers, so that each portion may fall behind the shoulders, to be passed under the chest. In front of the chest the two portions are crossed, the left passing to the right, and the right to the left. Each side is carried through the collar, and back,



Fig. 57. — The Loop of Delwart's Truss.



Fig. 58.—Delwart's Truss applied.

over the front of the shoulder, at the top of which both are tied in

a simple knot, so as to be easily untied when required. At ten or twelve inches from this, a firmer knot is tied, then several others beyond it towards the loins—according to the length of the animal—and at nearly equal distances, as far as the root of the tail, where a simple knot is tied. The branches of the cord then separate on each side of the vulva, and unite again by a simple knot below the inferior commissure; again separating, each cord is carried between the hind-legs, brought up by the flank towards the loins on each side, and tied over the back to one of the loops there, as shown in Fig. 59. This truss can be made as easy or tight as may be necessary, and its simplicity is its great recommendation."—*Ibid.*



Fig. 59.—Renault's Truss.

"Lund's truss." The invention of Lund, a Danish veterinary surgeon, and greatly lauded for its cheapness, simplicity, and efficiency, is, in my opinion, far the best.

"The chief part of it is a narrow piece of iron, nine millimetres thick (about one-third to three-eighths of an inch), welded at its extremities, and turned into a triangular shape that enables it to include the vulva, while the loops at its three corners allow it to receive cords (Fig. 60). The base of the triangle, which fits under the tail, is about two to two and a half inches wide, and the sides

from five to seven inches long. The loopholes at the angles may be replaced by small hooks to receive the cords.

"This metal plate, which may be of round iron, and convex on one side, concave on the other, fits over the vulva and the base of the tail, the apex being below the lower commissure, while the convex side is towards the animal. Cords pass through the loops or around the hooks, one above, one below—as in Fig. 61—and are fastened to a surcingle or collar, or both, like the preceding trusses. Any blacksmith can make the plate in a few minutes; and from what has been said in praise of this cheap and simple method of retaining the uterus, there can be no doubt that it will be found most useful."

—*Fleming.*



Fig. 60.

In England various forms of truss are employed. That which

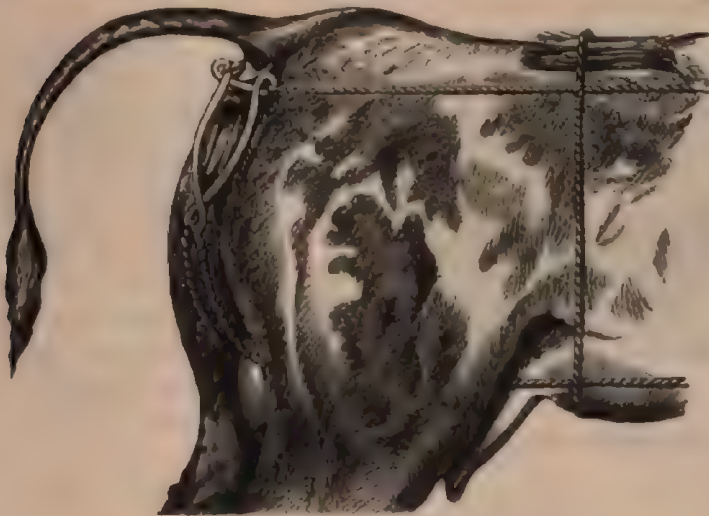


Fig. 61. —Lund's Truss applied.

most generally finds favour is composed of leather, with webbing attachments, and fixed in much the same way as slings are on a horse; but I always prefer the additional bandage proceeding from

the leather between the hind-legs. The leather may be cut different shapes, as denoted in Figs. 62, 63.

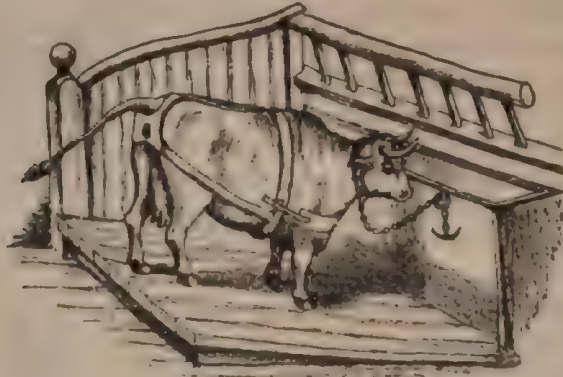


Fig. 62.—Leather Truss.—*Armatage*.

Fig. 62 is placed in opposition to the vulva, and immediately below the anus.



Fig. 63.—Leather Truss.—*Franck*.

Fig. 63 covers both anus and vulva, corresponding openings being made in the leather.

A horse's crupper-strap, drawn down just below the vulva, and attached in the same manner as the trusses already mentioned, forms an exceedingly useful agent in an emergency (Fig. 64).

HERNIA OF THE UTERUS.

Hernia of the uterus is not uncommon in the pregnant cow, several very interesting cases of which are recorded in veterinary literature.

Causes.—Pregnancy, relaxation, and weakness of the abdominal muscles, violent efforts; external injuries, as falls, kicks, blows, crushes, etc.



Fig. 64.—Crupper-strap Truss applied.—*Original.*



Fig. 65.—Hernia of the Uterus.—*Original.*

Symptoms.—In the cow the injury is not usually observed until towards the seventh or eighth month of pregnancy. A tumour is then perceived at the lower part of the abdomen on the right side, in the region of the mammary gland, and surrounded by more or less swelling. This tumour varies in size in proportion to the

extent of the hernia, but when once it appears it usually very quickly acquires enormous dimensions, descending sometimes nearly to the ground, and either displacing and carrying the mammary gland down with it, or pushing it aside (Fig. 65). A cow so affected walks with a straddling gait behind, the foetus within the tumour and its movements being strangely visible.

Treatment.—The hernial treatment can only be adopted after parturition, and the latter is usually accomplished without difficulty in the cow; occasionally, however, aid is required, and it is necessary to lift the uterus as far as possible into its natural situation by means of a rug or sheet held on either side by assistants or suspended by pulley-blocks. In some cases the life of the mother or foetus, or both, can only be saved by the Cæsarian operation; but such a resort is always attended with danger to the parent, and must be duly estimated by the accoucheur.

Parturition being safely accomplished, it becomes a question for consideration, whether the uterine hernia shall be operated for, or the beast made fit for the butcher; and for many reasons the latter measure is advisable. Under no consideration, unless the hernia has been successfully operated on, should the animal be allowed to breed again.

RUPTURE OF THE UTERUS.

Rupture of the uterus may occur before, during, or after parturition.

Symptoms.—The symptoms of rupture of the uterus are somewhat obscure; if during straining the accident occurs, it may be suspected by the sudden suspension of expulsive efforts, rapid syncope, running-down pulse, coldness of the extremities, cold perspirations, tremors, agitation, sighing, anxious expression of countenance, and occasionally a sanguineous discharge from the vagina.

Results.—Fatal hæmorrhage, peritonitis.

Twelve interesting cases of ante-partum rupture of the uterus are recorded in Fleming's "Veterinary Obstetrics," and the same authority records four cases of what the Italian veterinarians designate as *semi-mobile uterus*. "This," he says, "is a condition in which the uterus has been completely divided across, either at the body or the cornua, and remains floating in the abdominal cavity, being only suspended by the broad ligaments. The most singular fact connected with these cases is, that although the

uterus is torn in this manner, its contents—the foetus and membranes—do not escape; the section cicatrizes, and the organ appears as a large kystoid tumour."

With regard to these curious and very interesting cases, Saint-Cyr is of opinion that, to allow the foetus to remain in the detached portion of the uterus, the separation must have taken place slowly and gradually, and that cicatrization must have been going on in the portion already separated—the work of union and disunion being simultaneous.

Treatment.—This consists in the prompt extraction of the foetus, and, if necessary, gastro-hysterotomy.

Rupture of the uterus after parturition is usually due to injury received in too forcibly returning the organ when inverted, or from parts of an embryotomized foetus. The rent should be closed by continuous catgut suture, followed after its return by antiseptic treatment. In severe cases amputation may be necessary. Fourteen cases of this accident after parturition are recorded in Fleming's "Veterinary Obstetrics."

DROPSY OF THE UTERUS.

Dropsy of the uterus (*Hydrops uteri*) is a condition not unfrequently met with in the cow. It may be associated with pregnancy, arise from uterine injury, or be due to certain constitutional conditions, notably anæmia.

Symptoms.—This disease may and has frequently been confounded with pregnancy, or other abdominal enlargements. A careful examination, however, will reveal a marked difference between a fecundated uterus and either of the latter; the absence of solid bodies, and the usual hard and tense feel of a dropsied uterus, together with its circumscribed shape and fluctuation, and when the accumulation is excessive, the spontaneous evacuation of fluid, point out the improbability of pregnancy or other abdominal enlargements, except in the earlier stages.

Rainard says: "When this collection is forming, the abdomen gradually enlarges as in ordinary gestation; the animal looks healthy, and there is scarcely any difference between this state and that of pregnancy before the second, third, or even the second half of gestation. It is rare that these collections persist more than five or six months without being evacuated at least once, and

it is usual to see this evacuation take place every month, or at least every two months. The fluid is greyish-coloured, and it is often as much as an ordinary bucketful."

Saint-Cyr remarks that this dropsy arises after a supposed successful copulation, and that, with the exception of non-fœtal movements, the effusion gradually develops, accompanied by all the indications of true pregnancy. Subsequently signs of parturition and abortion appear, with a modification of the expulsive efforts seen in the latter, the straining resembling that of micturition or defecation.

An interesting paper on this subject, recording numerous cases, by W. A. Cartwright, of Whitchurch, appears in the *Veterinarian*, vol. xlv. p. 562, and in Fleming's "Veterinary Obstetrics" a more recent one is mentioned by Suchanka.

Two forms of uterine dropsy exist: 1. When the serous effusion is poured out between the walls of the organ; 2. When the accumulation is confined to the cavity of the uterus. The latter is usually observed in the cow.

Treatment.—Evacuation, antiseptic and astringent injections; and medicinally, iodide of potassium, mineral tonics, with liberal diet.

UTERINE HÆMORRHAGE.

Hæmorrhage from the uterus usually occurs after parturition (flooding), the result of uterine injuries inflicted during the delivery of the calf, or from the untimely removal of the placenta. It may, however, be a precursor of abortion, and has already been alluded to as a symptom of cancer, while it also accompanies inflammatory disease of the cervix, endometritis, congestion of the ovaries, and various tumours or polypi. It likewise occurs in placenta prævia, two very interesting cases of which are recorded by A. E. Macgillivray, M.R.C.V.S., Banff, N.B., in the *Veterinary Journal*, March, 1881.

Symptoms.—The symptoms which accompany uterine hæmorrhage under and after labour are those of venesection generally, viz., a running-down pulse, ultimately becoming indistinct and fluttering, laboured breathing and continual sighing, pallid mucous membranes, distressed countenance, brilliant and glassy eyes, cold extremities and perspirations, grated teeth, and arched back. After the first flooding the animal may lie down quietly for a time, until a return of the hæmorrhage and its irritation causes her to strain

again. In secondary cases the general symptoms are more severe, and unless prompt measures are taken death from syncope speedily supervenes.

Treatment.—This consists in arousing the vital energies, and the immediate suppression of further bleeding. The first is fulfilled by the administration of brandy, whisky, ammonia, or ether, and the latter consist in injections of cold water, solutions of tannic or gallic acid, perchloride of iron, sulphate of zinc or alum, or plugging the os uteri with sponge. Ice, bags of snow, or cold water poured slowly over the loins, is also serviceable.

UTERINE POLYPUS.

These tumours are of various kinds, sometimes of a soft fleshy nature, containing mucous kysts, at others multiple, composed of puckered or gathered mucous membrane, or, as is more frequently met with in cattle, fibroid.

Symptoms.—Irregular hæmorrhage, leucorrhœa, uterine irritation, and straining.

Diagnosis.—Vaginal examination.

Treatment.—Removal by *écraseur*, ligature, or torsion, followed by styptic injections.

UTERINE KYSTS.

The formation of unilocular kysts, or inclosed sacs in the substance of the uterus or underneath its mucous membrane, are not uncommon in the cow. These kysts are smooth, and contain mucus or serum. As they increase in growth they give rise to considerable inconvenience and irritation.

Treatment.—If within reach, the treatment consists in puncture; or if pedunculated, they may be ligatured or removed by torsion or the *écraseur*.

INDURATION OF THE CERVIX UTERI.

This condition, by which is implied a morbid alteration in the structure of the cervix, usually fibrous, is peculiar to the cow. Bouley's explanation of this fact is that "irritation produces in the bovine species phenomena of *induration* much more durable than in any other species: in proof of this, witness the plastic engorgements—so adverse to suppuration, and so slow to disappear—

which are caused by a seton introduced beneath the skin of an ox; witness, also, the enormous swellings observed as a consequence of inoculation for pleuro-pneumonia (bovine), and those indurated tumours, vulgarly designated *osteo-sarcomatous*, so frequent on the maxilla, and which repeated irritation produced by the prick of a needle are sufficient to produce. This seems to be a general organic fact, of which induration of the cervix uteri is only a particular instance."

In diagnosing this condition considerable care and experience is required, or we may fall into the error of mistaking for a diseased condition a merely rigid or spasmodic state of the cervix for induration. "The distinction between what we may term the *functional derangement* and the *pathological alteration* of this part, is of great importance from an obstetrical point of view; as the first may be remedied by the mild and innocuous measures enumerated, while the second can only be overcome by a more or less serious surgical operation.

"In some cases perhaps the induration is congenital; but it must be admitted that, as a rule, it is due to the influence of disease or injury—past or present—in the textures. It may, therefore, be expected to be more frequent in old animals, or those which have already been bred from, than in those which are young or are pregnant for the first time, though these do not appear to be exempt."—*Fleming*.

Symptoms.—Protracted labour-pains; protrusion, when lying, of a nodulated irregular-shaped tumour; transverse, solid, non-yielding fibro-cartilaginous rugæ in the os; thickening and corrugation of the walls of the cervix, and blood-staining of the hand on withdrawal from examination, are the leading indications of induration. More or less debility and lassitude accompany the disease.

Treatment.—Partial or complete incision of the cervix in one or more places, and subsequent dilatation, may suffice in the case of pregnancy for the extraction of the foetus. The other and more dangerous alternative is the Cæsarian operation. When cervical incisions are made, they should be as nearly as possible at equal distances from each other. Partial incisions have been recommended on the ground of preventing extensive laceration of the uterus during the foetal passage. Out of forty cases collected by Saint-Cyr, upon which vaginal-hysterotomy had been performed, twenty-eight survived, and fourteen calves were delivered alive.

Autopsies made by Lecoq, Gellé, Horsburgh, and Macgillivray, of animals which died from, or were killed because of, induration of the cervix uteri, are recorded in Fleming's "Veterinary Obstetrics," in which are also mentioned some extremely interesting and successful operations for the same, and in English literature notably those by A. E. Macgillivray.

Results.—"There is no doubt that, in the majority of instances, and in the hands of careful obstetrists, vaginal hysterotomy will be successful, and will prove a useful operation.

"As a rule after the operation, and for a period of eight or ten days, there is a muco-purulent discharge from the vulva; but the cow eats, ruminates, gives the usual quantity of milk, and does not appear to be any more inconvenienced than after normal parturition.

"The unfavourable results, however, must not be overlooked. Serious injury to the neighbouring organs by the knife, or by the extension of the laceration, is within the range of possibility. When the cervix is completely divided, either by incision or by subsequent laceration during the passage of the foetus, we may have intense peritonitis arising from escape of the liquor amnii or other fluids into the abdomen, and speedy death. Or excessive hæmorrhage may lead to serious consequences.

"In every case, of course, there must be more or less bleeding from the incisions; but, as a rule, this is of no importance, and it ceases after a time. In less frequent cases, however, it persists, and either brings on great debility, or, if excessive, will lead to a rapidly fatal termination. This result is most to be apprehended when the cervix is greatly degenerated, and its tissue extremely vascular—as in carcinoma and sarcoma. It may also occur from rupture of bloodvessels, in laceration of the cervix or body of the uterus, during the passage of the calf through the incised os.

"When serious hæmorrhage occurs, cloths or sponges steeped in cold water, astringent lotions, and styptics—as the perchloride of iron—should be applied as close to the part as possible; while cold-water irrigation should be maintained on the loins.

"Another result is metritis, or metro-vaginitis, which is rapidly fatal, and in which we find the usual local lesions on making an autopsy. Septikæmia is also to be apprehended; and to prevent it, it is well to remove every source of putridity, or anything likely to become putrid, and to use plentifully a weak solution of carbolic acid (1 to 100) or the permanganate of potass in the interior of the uterus, and particularly about the incisions in the cervix, even for some days after the operation."—*Fleming.*

CHAPTER XI.

ANATOMY AND PHYSIOLOGY OF THE GENERATIVE ORGANS OF THE COW.

*External Generative Organs.—Internal Generative Organs.—Puberty.—
Estrum.—Fecundation.—Changes in the Ovum.—The Fœtal Membranes.
—Placenta.—Multiparous Gestation.—Anomalies of Gestation.—Impotence
and Sterility.*

IN all works relating to cattle pathology, parturition necessarily occupies a prominent position. A large number of animals are yearly lost from want of assistance in giving birth to their young. No class of animal, perhaps, presents to the pathologist a greater number of *fœtus-in-utero* positions than does the cow, and hence it is owing to this deviation from natural conditions that artificial aid is so frequently required, and even this, however skilful, is at times futile. Before proceeding to the subject of parturition, an enumeration of the organs implicated, and a few remarks concerning their anatomical structure and their physiological changes, may not be out of place.

Externally, the female generative organs are : the *vulva*, *clitoris*, *meatus urinarius*, *orifice of the vagina*, and *mammæ*.

Internally : *the continuation of the vagina*, *uterus*, *fallopian tubes*, and *ovaries*.

The *Vulva* is an elongated vertical fissure beneath the anus. It is composed of two thick soft lips (*labia*) or longitudinal folds, which terminate in a prominent point furnished with hair. These lips are made up of adipose, areolar, and elastic tissue, with the accompanying vessels, nerves, and glands. They are covered externally with fine smooth integument, and internally by mucous membrane. The junction of the labia above and below form the *commissures*. The superior commissure, which is very acute, almost reaches the anus, and is only divided from it by a small

space—the *perineum*. The inferior commissure is more rounded and obtuse; it lodges the clitoris. The cavity of the vulva contains: the hymen, or membranous fold situated at the vaginal entrance, but rarely seen in cows; the clitoris, and the *meatus urinarius* and its valve.

The Clitoris.—This bears an exact analogy to the *corpus cavernosum* of the male penis. In the cow, compared with other animals, it is long and tortuous. It is composed of erectile tissue and vessels, is exceedingly sensitive, and covered with mucous membrane. Like the penis, it has a prepuce (*preputium clitoridis*) a variously-folded cap of mucous membrane having a small excavation in the centre resembling the urethral opening in the male. Frequently in "heat," and always during the act of copulation, the clitoris is erected, and through its contact with the penis the chief venereal excitation is occasioned.

The *Meatus Urinarius*, or mouth of the urethra, is very short; it is situated on the floor of the vulva cavity, from 3 to 5 inches from the external opening. Its orifice is covered by a large fold of mucous membrane extending outwards; this is called the valve of the *meatus urinarius*.

The Mammæ.—The *mammæ*, or apparatus for the secretion of milk, are situated in the inguinal region. They are composed of four distinct glands or "quarters," each one being supplied with a teat. Very frequently two rudimentary (generally imperforate) teats are found behind these. At the base of each one, and in the centre of the gland, there is a single galactophorous sinus, into which all the lactiferous ducts open. This sinus in aged cows and those which have been deep milkers becomes very large, and has a distended appearance even when empty—as also the canal continuous from it. Such a condition constitutes what is commonly termed a "wind-pap."

Vagina.—The vagina is a membranous canal commencing at the vulva and terminating at the uterus. It is composed of a peritoneal coat, and muscular walls with connective tissue, bloodvessels, and nerves, and is lined with mucous membrane arranged in transverse rugæ, and abundantly moistened with its secretion.

The vagina acts as a medium of copulation, an outlet for uterine discharges, and the passage of the foetus. It increases in size from

youth to maturity, and at each parturition, its dimensions during the latter process being considerable.

Uterus.—The uterus, or womb, is the receptacle for the ovum, and in which the latter is developed. It is situated in the abdominal cavity, and partially within the pelvis (the "basin-bone" of the ancients). It is composed of a body and two horns (cornua). The body is elongated and narrow. The horns are thin, tapering, and curve upwards and forwards. Immediately above the uterus is the rectum; below it, the bladder and the colon. Externally it is invested with a serous coat; beneath this is a muscular one. It is lined internally with mucous membrane, and supplied with bloodvessels, lymphatics, nerves, and glands. In young animals it is very small, but increases in size after impregnation, and loses much of its subsequent contractile power after frequent impregnations. Its internal surface is studded with smooth nodules termed *carbuncles* or *cotyledonal processes* (*placentæ uterinæ*). "These maternal cotyledons are most numerous in the cornua, and few and small in the body of the uterus. In volume they are about the size of a pea or haricot-bean in calves; at a later period they have acquired the dimensions of a button, and they increase largely and assume variable shapes during gestation. In the cow they are flat, or slightly convex on the top, and their colour is usually pale; after conception, however, they become red from the affluence of blood to them. They are intended for the implantation of similar processes existing on one of the foetal membranes, the chorion. Their number in the calf sometimes amounts to 30 or 40, and after parturition there have been counted as many as 80 to 120. Each is attached to the mucous membrane by a narrow pedicle, and in removing the foetal placenta after parturition, care has to be taken not to tear them off."—*Fleming*.

The neck of the uterus, or cervix uteri, in the cow varies from 2 to 4 inches in length, and is of a form nearly cartilaginous in character. The os uteri, or mouth, may be transverse or circular.

Fallopian Tubes.—These are the uterine tubes, or oviducts, which convey the ovum to the uterus. They are tortuous canals between 9 and 10 inches in length, commencing from the extremity of each horn, and terminating in a fringe (fimbriated extremity). It is these fimbriæ which are applied to the ovary and receive the ovum immediately it escapes, convey it to the orifice of the tube,

and hence to the uterus. (See "Fecundation.") The Fallopian tubes are composed of a muscular tissue, covered externally by serous membrane, and internally by mucous.

Ovaries.—The ovaries, or female testicles, are two elongated, somewhat flattened oval bodies situated on either side of the uterus, behind the Fallopian tubes and kidneys. They are suspended from the anterior border of the broad ligament, and connected to the uterus by a narrow band of muscular fibres (the *ligamentum ovarii*). They are also sustained in their floating position by the vessels which enter and proceed from them.

Structure.—The substance of the ovary is composed of a hard greyish-red matter divided into two layers—the *medullary* and *cortical*. Imbedded within the latter are the Graafian vesicles. The ovary is covered with a *serous membrane* and *tunica albuginea*. The first is a continuation of the broad ligaments, and envelops the entire organ, excepting the hilus. The latter is of a dense fibrous structure, and continues into the ovarian substance. Vessels, nerves, and lymphatics supply the organs. The Graafian vesicle is an envelope of fibrous membrane containing a clear yellow fluid, in which is the ovum or egg. This is again surrounded by a membrane containing the *yolk* and germinal vesicle.

Development of the Ovisacs.—"The ovisacs already exist in the ovary of the fetus and the young animal, but only assume their greatest activity at the age of puberty. They are not all formed at birth, but are incessantly redeveloped, this development taking place beneath the tunica albuginea. (At puberty the stroma of the ovary is crowded with ovisacs so minute that in the cow it has been computed that a cubic inch would contain 200,000,000 of them.)"—*Chauveau*.

It will be thus seen that the ovaries associated with the uterus occupy the most prominent position in the reproduction of species. As Fleming remarks, "The changes incidental to the procreative period of life in the female are chiefly centred in the ovaries and uterus: organs destined to play a pre-eminent part in the perpetuation of the species, and whose functions are interdependent. The ovary is doubtless the principal and essential agent in generation; as it gives the necessary and effective stimulus to the condition termed *rutting* or *heat*, and furnishes the germ which has been, or is intended to be, fecundated; while the uterus secretes mucus

and the peculiar fluid ejected at that period, receives the ovum, forms the decidual temporary or enveloping membranes in some cases, nourishes the fetus, and finally expels it. So that the ovaries and uterus co-operate in the accomplishment of the four chief functions of the uterine system: *œstrum*, *conception*, *gestation*, and *parturition*."

GENERATIVE PHYSIOLOGY.

"The acts by which generation is accomplished are four: these are *copulation*, *fecundation*, *gestation*, and *parturition*; but it is only on the attainment of a certain age—that of *puberty*—that these sexual offices are in activity, and they continue so for a variable period, according to the species. During this time, ova from the ovaries, fecundated by the male seminal fluid, are received into the uterus, and remain there for a regulated period, until they have become transformed into young creatures possessing certain physical attributes and resemblances to their parents. This is the gestation period, and is followed by that of parturition when the young are born."—*Fleming*.

PUBERTY.

"The generative functions of the domesticated female animals are, like those of the human female, only in a state of activity during the prime of life; and the most notable characteristic of their functions, as in woman, is their periodicity. These functions commence at puberty, when certain very marked modifications occur throughout the whole organism, but particularly in the generative organs of the male and female animals. In the first the testicles become more voluminous, and in some species they leave the abdominal cavity to be lodged in the scrotum; they also begin to secrete an abundance of a special fluid—the 'spermatic'—in which particles of a definite shape—spermatozoa—endowed with motion, appear. This fluid is stirred up in the *vesiculae seminales*, which, until this period, were small and wasted-looking. The organ for the conveyance of this spermatic fluid to the female becomes more developed, and is capable of complete and frequent

erection. In the female the mammae enlarge, the ovaries are more vascular and turgid-looking than before, and the Graafian vesicles are more or less developed. The periodic ovipont then begins to be carried on, with all the distinctive peculiarities which it is to bear during the prolific period of life.

"The age at which animals arrive at *puberty* or *sexual maturity*, is not only different in different species, but is influenced to some extent by the rapidity of their growth and the duration of their life. Domestication has more particularly brought about changes in this respect, and by inducing a more rapid development of the organism, has hastened the advent of this period.

"The aptitude to procreate, though generally admitted as an indication of adult age, yet appears before animals have attained their full physical development, and is present in some creatures at a comparatively early period of life, depending upon climate, food, and other circumstances. The cow usually conceives at from twelve to eighteen months, but there are many cases on record where conception has taken place long before these ages. 'Heifers have received the bull at five, six, seven, and nine months, and calved at fourteen, fifteen, sixteen, and eighteen months. In the first volume of the *Lancet* (1835-36) there is mention made of a bull calf less than three months old, which copulated with a quey calf about two months old, and within nine months the latter brought forth a calf. Quey and calf did well.'

"With regard to the period when procreation ceases in animals, I cannot discover any reliable data to arrive at a trustworthy conclusion. The mare has not ceased to breed after thirty years of age, and the cow and sheep have bred beyond twenty years. I have notes of mares producing foals at twenty-eight, thirty-two, and thirty-eight years of age."—*Fleming*.

CESTRUM OR MENSTRUATION.

"The *rutting*, *heat*, *æstrum*, or *venereal æstrum* of animals is analogous to 'menstruation' in woman, and marks the period of maturation in the ovarian ova or ovum, according to species. This condition is *intermittent* or *periodic*, not continuous; and is characterized by a peculiar systemic excitement that usually con-

tinues for a somewhat definite period in the two sexes. In the male and female, but especially the latter, the generative organs at this period become more or less turgid and sensitive, and the urogenital secretions are increased. In the female there is a determination of blood to the ovaries, and changes take place in these which have already been described. The excitation of the generative apparatus reacts on the whole system, and produces a kind of fever or irritability in the animal; its sensibility is increased, the appetite is more or less in abeyance or capricious, and usually there is thirst; if the secretion of milk has been previously active, it now diminishes, restlessness is a notable feature, and the movements betray the prevailing desires. There is an uncontrollable tendency to seek the opposite sex. Attempts at micturition in the female are frequent, but only a small quantity of urine is passed; the mucous membrane of the vagina is injected, and with solipeds there are oft-repeated movements of the clitoris and vulva, and an opaque white secretion, or even emissions of blood, are ejected spasmodically *per vulvum*.

"In other animals this ejection sometimes consists of a viscid, red-tinted or sanguinolent fluid. In all it has a special and powerful odour, which attracts the males, and enables them to distinguish between the females which are in 'rut' or 'heat,' and those which are not, as well as exciting in them the most ardent amatory desires.

"The uterine mucous membrane is also very much congested, and there is poured out on its surface a fluid containing epithelial *débris*, mucous corpuscles and blood-globules.

"The existence in the lower animals of what is analogous to the *menstrual discharge* in the human female has frequently been denied, but without any reason or proof. A discharge of blood from the sexual organs of woman announces the advent of puberty; and its coincidence with the maturity and escape of the ovarian ovule, as well as its periodical appearance, until the termination of fertility, establishes between this phenomenon and the 'heat' or 'rut' (*æstrum*) of animals a very close analogy. And this analogy is rendered complete by the fact that animals also at this period have more or less evident sanguine emissions. Kahleis, Fuchs, Spinola, Numann, and others, have observed this in the cow, and have also noted that the discharge occurs regularly at intervals of

nineteen or twenty days when the animal is not giving milk or in calf. The hæmorrhagic flow appears two or three days after the commencement of 'rutting,' and when this is most intense. The amount of blood does not exceed one or two ounces, and the coagulated clot remains in the vagina until it is expelled with the urine. There can be no doubt as to its source. If, at the moment when traces of it are perceived externally, the cow is killed and the inner surface of the uterus examined, blood will be seen exuding from the cotyledons.

"The cause of menstruation, or periodical discharges of blood in female animals, has received a satisfactory explanation from the researches of Rouget, who has established the fact that the utero-ovarian artery, on arriving at the body of the uterus, near the Fallopian tube, divides into curved or spiral boquets of vessels which open into veins, like the helicine arteries of the male cavernous sinus. Along the inferior border of the ovary, this artery forms a series of branches that wind and twist exactly like the arterial ramifications at the root of the *corpus cavernosum*, penetrating the stroma of the ovary, and giving rise to spiral convolutions. The venous system composes the uterine sinuses—contorted venous canals not unfrequently spiral, like the arteries.

'The uterus is, therefore, an erectile organ like the penis, and its erection is connected with the periodic hæmorrhage from its inner surface. The venous sinuses in the meshes of the muscular tissue, crossing each other at the hilus of the ovary, are partially compressed, and the immediate result is the distending and erection of the bulb of the ovary. This modification in the ovarian circulation extends to the uterus, so that both are in a state analogous to erection; the prolonged tension is communicated to the vessels and capillaries of the mucous membrane; the epithelium is shed, leaving the tunic of the capillaries exposed, and this soon gives way, whence results the hæmorrhage, which persists as long as the erection and obstruction to the free flow of blood through the veins continues. This is the case in the human female, but it must be admitted that, in several animals, the erectile formations are either in a rudimentary condition or entirely absent. In ruminants, small vascular masses or formations are observed near the cotyledons, which may be taken to represent the spongy texture of the human uterus.

"With regard to the season at which this 'heat' takes place, it has been observed that it is usually the spring-time, when food becomes plentiful, especially with herbivorous animals.

"With the cow whose calf is sold at from one to two months old, with a view to utilizing the milk, the season of course is varied: as care is taken to induce conception again as soon as the lacteal secretion begins to diminish; but it has been observed that mid-summer is more particularly the rutting season.

"The *frequency* and *duration* of the period of 'rutting' or 'heat' depends upon the age, species, and other circumstances; but it may be said to persist in the domesticated animals from one to fifteen days at the most. The shortest period is witnessed in the cow and sheep, and the longest in the bitch. It is sometimes only present from twelve to twenty-four hours in some non-fecundated animals. With impregnation, however, it ordinarily ceases until after parturition; and if impregnation does not occur, it gradually disappears until the next period, which is somewhat variable. Its re-appearance in the cow has been noted every month or three weeks, and sometimes at closer intervals.

"The periodicity is regulated by nature, with a view to the preservation of species; and in animals not influenced by artificial conditions, it is so arranged that the young creatures may arrive during the season when their maintenance will be best assured.

"The years during which oestrus continues varies with species, and particularly with regard to the age they attain; but it always disappears towards the decline of life.

"Climate, inseparable from the conditions of alimentation, exercises a marked influence on the 'rut,' in hastening its development and its periodicity; but the economical law to which it is subordinate does not vary.

"The cow, ass, and sheep, and, it is believed, the mare, will copulate with a greater certainty of success on the ninth day after parturition than at any other time.

"It must be remembered that various conditions influence the appearance of this function, and more or less change the period and the intervals of its advent. Warmth, shelter from vicissitudes of weather, an abundance of nourishment, especially that of a stimulating nature, and easy labour, favour its more frequent and early appearance, and especially a judicious bringing together of

the male and female. It has also been induced by the injection of certain substances into the vagina.

"The persistence of this condition for longer than the natural period is a symptom of uterine or ovarian derangement, and therefore unfavourable. It renders the animals of less value, or even dangerous, constituting the disturbance designated 'nymphomania.'"—*Fleming*.

FECUNDATION.

"The effective intercourse of the male with the female is followed by certain remarkable changes in the ovum and generative apparatus of the latter, which, at first known as *fecundation*, *conception*, or *impregnation*, ultimately results in the formation of a new creature possessed, to a certain degree, of individual or independent life. The intercourse, to be effective, depends upon the presence of a healthy ovum in the apparatus of the female, and the introduction into this apparatus of the seminal fluid by the special organ of the male. This fluid contains the essential elements known as 'spermatozoa'—organic particles of a peculiar shape, and endowed with motion. For conception it is absolutely necessary that the ovum of the female should be brought into contact with these particles; though whether this contact can occur in the ovisac, prior to its escape, has not yet been definitely ascertained. It is certain that by reason of their particular movements, and also doubtless through the aid they receive from the special motion of the ciliated epithelium covering certain portions of the lining membrane of the uterus, these spermatozoa, when the uterine opening is patent, are diffused soon after *coitus* to the most distant parts of that cavity, and high up in the Fallopian tubes; though they have never been traced so far as the ovisac. Nevertheless, a very strong argument in favour of their attaining this region, and producing what is called 'ovarian' or 'tubal impregnation,' is afforded in the occurrence of extra-uterine—ovarian or tubal—gestation; for in this case the spermatozoa must have reached both oviduct and ovary.

"Before the ovum leaves the ovary, changes occur in it which may be noted here. The germinal spot, previously at the inner surface, passes to the centre of the germinal vesicles; and this, which

was before at the surface, goes to the centre of the yolk or *vitellus*; while the membrane investing the latter, from being thin, suddenly thickens. When the ovum is discharged, the *tunica granulosa* and *retinacula* accompany it through the small opening in the vesicle; the whole being received into the pavilion or infundibulum of the Fallopian tube, which at the time is firmly applied against the ovary. Arrived at this part, the ovum is carried along by the slow vermicular motion or contraction of the tube, as well as by the ciliary movement of the cells covering the mucous membrane lining this duct, until at last it reaches the uterus."—*Fleming*.

Regarding the early diagnosis of pregnancy, various conditions have been stated to exist—such as *cessation of oestrus*; refusal of the bull; change of character—if previously wild and untractable, the animal becomes docile and gentle; tendency to fatten; morbid appetite, etc.: whilst "According to a correspondent of the *Milch Zeitung*," says the *Farmer*, "the following is a trustworthy and simple means of determining whether a cow is in calf. Some of its fresh-drawn milk should be allowed to fall, drop by drop, into a glass containing clear spring water. If the drops spread out and get mixed with the water, the cow is not pregnant; if, on the other hand, they quickly sink whole to the bottom, she may safely be declared in calf. In the case of young cows, whose first pregnancy is in question, a little of the fluid in the udder should be milked upon the palm of the hand. If the fluid be tenacious, viscid, and gummy, it is a sign of pregnancy, and the greater its tenacity the further has pregnancy advanced; if, however, it be thin and watery, the animal is not in calf. The writer does not pretend to offer any explanation of why these things should be; he simply avers that they are facts which have never played him false in a lengthened experience, and invites his brother dairymen to test for themselves."

CHANGES IN THE OVUM.

The various alterations that occur in the ovum as it proceeds to the uterus and after its arrival there are very remarkable. *Fleming*, in his able work on "Obstetrics," very clearly describes and illustrates these changes. In a work of this description I should be trespassing too much upon its space were I to write a tithe of this

wonderful part of generative physiology. And although it constitutes such an interesting department of physiological science, yet, as Dr. Carpenter observes: "It is a branch of the inquiry, however, which has, and seems likely to have, less *practical* bearing than any other; for neither as regards the preservation of the body in health, nor in its restoration from disease, is it easy to see what direct benefit the most exact knowledge of embryonic development is likely to afford.

"The chief subject on which it throws light is that of congenital malformations and deficiencies, many of which are now distinctly traceable to *arrest* or *irregularity* of the development processes, some of them indeed to *excess*."

Having encountered the male spermatozoa and fructification being established, the impregnated ovum commences to assume a new character; certain important changes continue to take place. This development has been divided into seven periods, which are given as follows by Fleming.

First Period.—Towards the second week after conception, the ovum or germ has passed from the ovary into the uterus; it is then about a line in diameter ($\frac{1}{16}$ inch).

Second Period.—In the third or fourth weeks of gestation there appears the first traces of the embryo, and the head, body, and limbs can be distinguished. Towards the twenty-eighth day, the embryo measures 4 lines.

Third Period.—This is from the fifth to the eighth week. The embryo has acquired a length of $1\frac{1}{2}$ inches.

Fourth Period.—This is from the ninth to the twelfth week. The length of the foetus is $5\frac{1}{2}$ inches.

Fifth Period.—This extends from the thirteenth to the twentieth week. At this stage the foetus is 12 inches long.

Sixth Period.—From the twenty-first to the thirty-second week. The foetus in this period has acquired a length of more than 2 feet.

Seventh Period.—From the thirty-third to the fortieth week.

A newly-born calf measures 2 feet.*

* This, excepting the smaller breeds, is an error.

THE FŒTAL MEMBRANES.

The membranes investing the foetus or *annexes* are: the *chorion*, the *amnion*, the *allantois*, the *umbilical vesicle*, the *placenta*, and the *umbilical cord*.

The *Chorion* forms a covering externally to the whole of the ovum with the exception of the placenta, whose surface it also

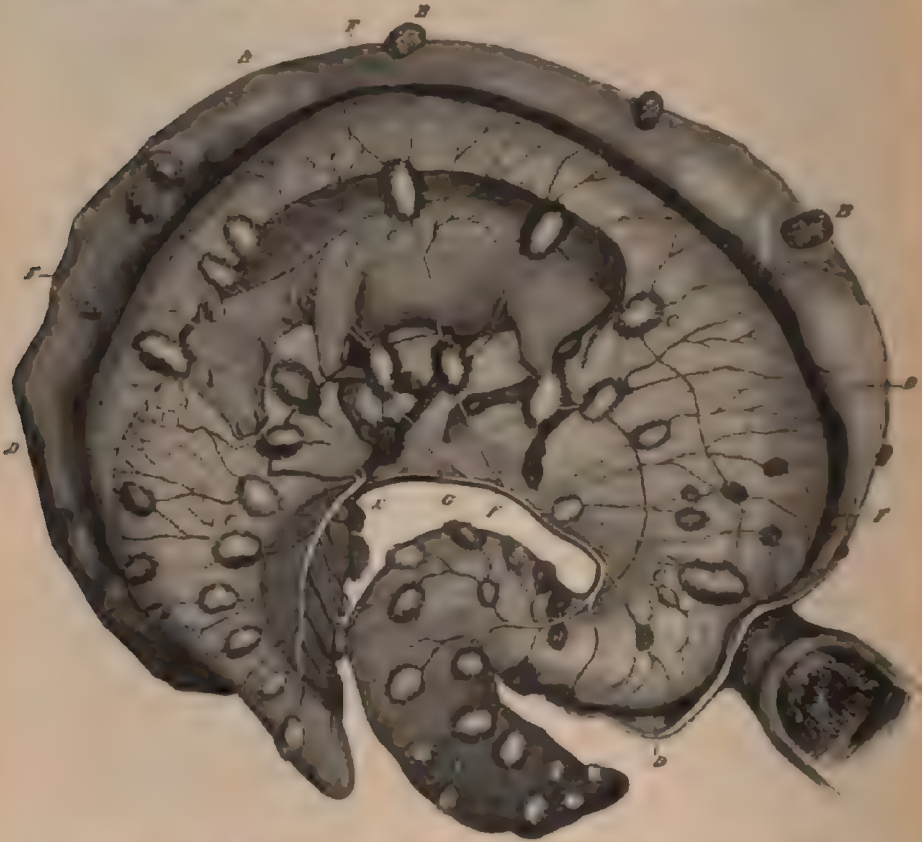


Fig. 66.—Fœtal Membranes of the Cow at Mid-Term: *a*, uterus opened on its left side; *n, n*, cotyledons of the uterus; *c, c*, placentulae; *d, d*, allantois; *e*, vesicle of the urachus; *f*, amnion; *g*, umbilical cord.—*Colin*.

covers. It is present in the earliest stage of conception, and serves as a protecting agent for the foetus, assisting to form, with the amnion, a sac containing fluid (*liquor amnii*).

The *Amnion*, or next membrane, is thin, transparent, tough, and of great similarity to the former, but of greater strength. The two are united together by a transparent substance termed the *tunica media*. Its distinct function is the secretion of the liquor amnii or foetal waters, in which the young embryo floats. The use of this fluid is supposed to be to prevent uterine pressure on the foetus, and also to keep up an equal temperature in the foetal body (being a non-conductor of heat), and also, by lubricating the vaginal passage, to facilitate birth.

The *Allantois* is a thin, pellucid, slightly fibrous membrane covering the inner face of the chorion, and is easily demonstrated from the former by the inflation of air. It secretes a fluid similar to that of the amnion, which in the early period of foetal life contains a large amount of sugar, which ultimately disappears. Later on this fluid has been considered the foetal urine.

The *Umbilical Vesicle* is a small pouch lodged in the infundibulum, at the extremity of the umbilical cord. It is red, of a vascular nature, supplied by the anterior mesenteric with an artery, and has a corresponding vein. Towards the latter months of pregnancy it becomes more or less atrophied, and finally appears as a thin reddish-brown cord. Its vessels are similarly disposed of.

PLACENTA.

The placenta, commonly known as the "after-birth," are appendages to the foetus *in utero*, whose function it is to assist in the nourishment and development of the foetus. As the period of gestation advances, these appendages become more vascular and defined. It is composed of numerous vascular tubercles or tufts covering the whole of the external surface of the chorion, which are in apposition to corresponding depressions in the lining membrane of the uterus.

"In the cow, the villi of the chorion are developed and agglomerated in large numbers at certain points of its surface, to constitute a *multiple or tufted* placenta, which is composed in this way of from sixty to eighty *placentulae*, or 'foetal cotyledons.' The maternal cotyledons are nothing more than appendages or thickened points of the mucous membrane, whose utricular follicles, more numerous

than elsewhere, have become enormously enlarged, and crypts have been formed. They are permanent, as before conception they are certainly present on the inner surface of the uterus, and traces of them may be already found in the foetus of four or five months. Observation also appears to have demonstrated that they may be increased in number or regenerated when accidental circumstances

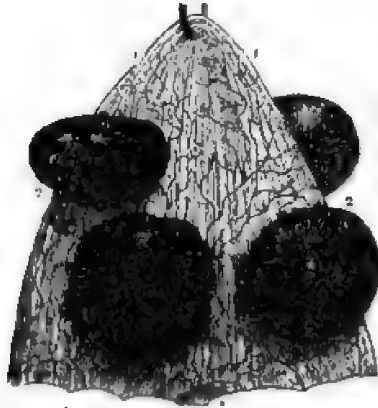


Fig. 67.—Portion of Chorion with Placentulæ of Cow : 1, chorion ; 2, placentalæ.—Gurlt.

render those in existence insufficient.* They have been discovered in the foetus in process of formation, and regularly disposed, beside the ordinary cotyledons."—*Fleming*.

"The 'foetal' or 'chorial cotyledons' repeat the disposition of the maternal cotyledons. They are bright-red concave patches, each exactly fitting into the sinuses of the corresponding uterine processes, with which they strikingly contrast in hue. On their surface they offer a multitude of long, conical, ramifying or branched villi, measuring from four to six-tenths of an inch, which are received into the depressions of the maternal cotyledons. This ramifying or racemose disposition of the choral villi is peculiar to the bovine and ovine species. The choral cotyledons are attached to the chorion by a very short, thick, and vascular pedicle ;

* In the *Journal de Méd. Vétérinaire de Lyon*, M. Strebel, of La Tour, Switzerland, gives an instance in which there was absence of the uterine cotyledons in a cow, and the placenta was like that of the mare. Conception took place, gestation went on favourably, and parturition was normal.

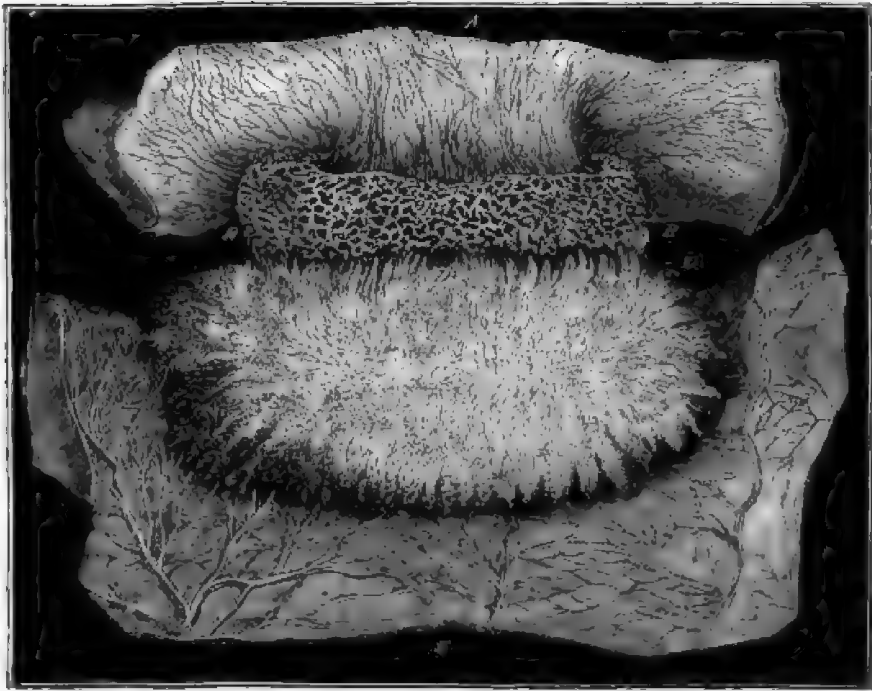


Fig. 68.—Maternal and Foetal Cotyledons of the Cow: A, pedicle of the maternal cotyledon; B, B, maternal cotyledon; C, foetal cotyledon; D, placenta, villi; E, chorion.—*Cotlin.*

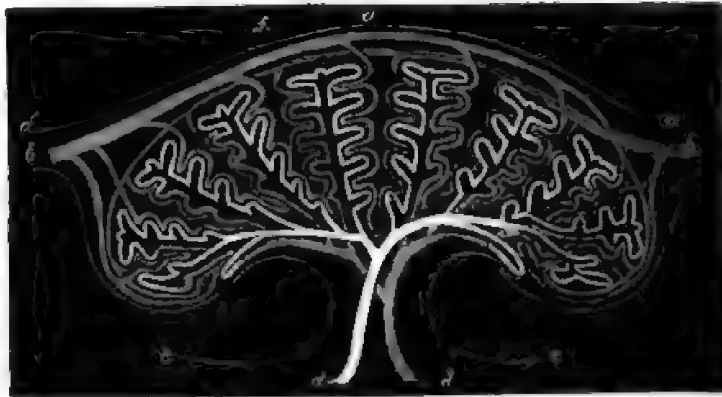


Fig. 69.—Cotyledon of a Cow's Uterus: a, a, surface of foetal chorion; b, b, blood-vessels of foetal chorion; c, c, surface of uterine mucous membrane; d, d, blood-vessels of ditto; f, secretion from utricular glands—cotyledonous milk—between maternal and foetal vessels, and which is necessary to the mutual interchange of gases, and nutrient, effete, and other matters between parent and offspring.—*Pettigrew.*

between them and the maternal cotyledons there is always to be found a small quantity of thick, white, milky-looking fluid—the so-called ‘cotyledonous’ or ‘uterine milk.’

“According to Schlossberger, this uterine milk should be considered as a fluid analogous to milk or chyle. It contains 88 per cent. of water, 1·5 of fat, 0·7 of salts, and 9·6 of a protein substance.”—*Fleming*.

MULTIPAROUS GESTATION.

The causes of multiparous gestation in the cow are the same as those which operate in producing the like effect in other animals who usually have only one, or at the most two, young at a birth—as the mare, ass, and sheep: that is, a multiparous gestation is due to the number of Graafian vesicles ruptured, and the impregnation of the requisite number of the ovules they contain; or it may be from a double yolk. Again, such impregnation may occur not simultaneously but successively, by consecutive copulations.

Mr. J. Maegillivray, of Banff, in his “Manual of Veterinary Science and Practice,” 1857, writes: “A neighbour of mine, Mr. Peter Low, had a cow, a splendid animal of the cross breed, which had twin calves yearly for six successive years. Two of her female progeny have had twin calves repeatedly. Mr. Low kept one of her male twins, a bull; to him two cows have had twin calves, and there are a number of cows in calf to him just now. From this and other similar cases, I think there is no doubt but, by proper selection and management, a race of twin-bearing cattle might be established.” He further remarks: “From a paper now lying before me, I shall record what I believe to be a unique case of a calf-producing cow. I am indebted for the particulars to Mr. James Stephen, Balding Cottage, Alford. ‘Memorandum regarding a small cow of the black polled breed, which belonged to the late Mr. Alexander Stephen, Farnton, Alford:

YEAR.	NO. OF CALVES AT A BIRTH.		
1842	1—First calf.
1843	3—Came to maturity.
1843	4—One died (seven in one year).
1844	2—Came to maturity.
1845	3—Came to maturity.
1846	6—Died prematurely.
1847	2—Came to maturity.
1848	4.”

Cases of triple, quadrigemellar, and quintuple gestation have been recorded. Kurds mentions an abortion in a cow of seven fetuses. Kleinschmeid found fifteen embryos in the uterus of one of the bovine species.

ANOMALIES IN GESTATION.

These are: *superfœtation*, *extra-uterine pregnancy*, and *spurious pregnancy*.

Superfœtation (*fœtus-super-fœtum*, one fœtus on another) is where a second conception is supposed to have taken place in an already pregnant animal. Though believed in by the old writers, modern science has shown the impossibility of such an occurrence unless the second conception took place before the first ovum entered the uterine cavity, before the formation of the deciduous membrane, and before the os uteri had become sealed by the tough gelatinous secretion which effectually closes the organ; or else such a phenomenon might be due to the possession of *two uteri*, or one divided into two chambers by a septum—a condition which has been observed in the human being—first one chamber becoming impregnated, and subsequently the other.

Superfœtation (so-called), when not arising from the above conditions, "is," says Dr. Ramsbotham, "easily explained upon the supposition that the patient originally conceived of twins; that one lost its life early in gestation, either from some cause influencing the mother's system, or from some defect of structure or diseased action inherent in itself; and that the process of gestation was carried on for the benefit of the live fœtus, till they were both expelled together, or nearly at the same time, at the full period of pregnancy. The only difficulty attached to this solution is that these secondary fœtuses, although invariably dead, are often perfectly fresh, bearing about them no marks of putrefaction. But this may be explained by their never having been in contact with the external air; or perhaps it may be accounted for by the powerful vital principle which is resident in the gravid uterus, and which is in fervid operation for the purpose of bringing to perfection the living being it contains, protecting the dead mass from the ordinary changes of decay, and acting as an antiseptic power."

Extra-uterine Pregnancy.—This condition arises when the

ovum after impregnation does not reach the uterus, but remains in the ovary, the Fallopian tube, or, escaping the fimbriated extremity of the latter, falls into the abdominal cavity. In whichever situation it may be lodged, development takes place; but the placenta in such cases is more extended and of thinner structure.

Extra-uterine pregnancy is divided into four varieties: *ovarian*, *tubal*, *abdominal*, and *parietal* or *interstitial*.

1. *Ovarian*, when the ovum remains in the ovary.

2. *Tubal*, when the ovum has stayed in its passage through the Fallopian tube and become attached there.

3. *Abdominal*, when the ovum is lost from the grasp of the fimbriated extremity of the Fallopian tube, and falls into the abdomen.

4. *Parietal* or *Interstitial*, when the ovum becomes deposited within the uterine walls instead of in its true cavity.

Several interesting cases of extra-uterine foetation are recorded in Fleming's "Veterinary Obstetrics."

Spurious Pregnancy is that condition which simulates normal pregnancy. Such accidents are far from common in the lower animals; they are described as *moles*, *uterine kysts*, and *hydrops uteri*.

Moles are large fleshy masses the result of a diseased or blighted embryo, the remains of which are discovered on examination, such as skin, hair, bones, muscles, etc.

The following short analysis of some instances recorded in the annals of Veterinary Science, are given by Fleming:

"In the 'Recueil de Méd. Vétérinaire' for 1828 (p. 370), Saussol describes the case of a cow three months in calf, and which, when harnessed to a carriage, fell on its abdomen with great force against a stone. After this accident it lost condition, pined away, and at last died. When opened, instead of an ordinary foetus, there was found an oval-shaped consistent fleshy mass, of a reddish-violet colour, floating in a rusty-tinted fluid, and which had obtained its nourishment by means of a single cord—no doubt emanating from some cotyledon. This tumour contained the skeleton of a foetus, the bones of which were normal and not displaced, being held together by means of ligaments.

"Lénaux (*Journal de Méd. Vétérinaire de Lyon*, 1846) states that a cow seven months pregnant, after two days' violent straining, ejected a dead foetus and a large tumour, and died immediately afterwards. The tumour weighed five kilogrammes, was of no particular shape, was reddish-brown in colour, soft, but very vascular and covered by a fine, apparently pseudo-membranous, envelope. No trace of peduncle or uterine adhesion could be

detected. The whole mass was of a fibrous texture, and composed of a multitude of small vesicles containing an amber-coloured serosity.

"Mr. Snowdon, in the *Veterinarian* for 1856 (p. 218), states that on January 30th a cow produced a healthy female calf. Nothing unusual was observed during the day, but about six p.m. the animal appeared to be in pain, when Mr. Snowdon was called. He found a membranous sac hanging from the vagina, to nearly as low as the cow's hocks. This was punctured, but only a small quantity of fluid escaped, though a mole appeared, which was attached to the placental membranes by an umbilical cord. This was divided, and the animal continuing in pain, an examination was made per vaginam, when another calf was found in the uterus. This was delivered,



Fig. 70.—A Mole.—Zundel.

when it was discovered to be a male calf, well developed, but dead. The cow did well afterwards. The anidian monster was in shape a flattened ovoid, about two inches in thickness, and six inches by four in size. It was covered with long red hair; though at the border, where the umbilical vessels enter, was a hairless spot. On the opposite border was the rudiment of a lower jaw, containing four well-developed incisor teeth, three of which had cut the gum. Above this was a small cartilaginous ear, and near it something like an eyelid. Several bones were contained in the mass, one of which had the shape of the bones of the skull; though, as a whole, it felt spongy and elastic. Its weight was fourteen ounces.

"In the '*Annales de Méd. Vétérinaire*' for 1859, May mentions having delivered a normal calf, and afterwards the cow expelled an oval mass the

size of a child's head, covered with a fine velvety skin, and showing at one point an umbilical cord. This skin enveloped a vascular spongy tissue, mixed with muscular and glandular portions, and in its centre was a small soft bone about an inch in length.

"Lavocat (*Journal de Vet. du Midi*, 1866), relates that having delivered a cow of a well-formed calf, and before the removal of the membranes, a kind of downy ball was expelled, which was only attached to the latter by a vascular prolongation, comparable to an umbilical cord. The mass was oval in shape, as large as a lamb's head, everywhere covered with hair, and at the middle was what appeared to be a regularly-formed umbilical cord. At one of its extremities was a shallow cavity terminating in a *cul-de-sac*, the irregular margin of which bore the incisor teeth projecting beneath the gums. There was no trace of thoracic or abdominal cavities or organs; neither was there brain, spinal cord, or nerves. Some bony fragments were found, among which were the rudiments of a lower jaw bearing the teeth already mentioned. The remainder of the tumour was made up of very vascular cellulo-adipose tissue, the meshes of which were filled with serosity.

"In the *Veterinarian* (vol. xlv. p. 275), Mr. Creswell describes an anidian monster produced by a white short-horn cow, two hours after delivery of a healthy and well-developed bull-calf of a roan colour. This monstrosity was round, and about the size of the crown of a hat.(!) It weighed eighteen ounces some time after it had been found, but was much larger and heavier when first expelled; it was thickly covered with long fine *white* hair, which was longest and thickest on one side; at the part where it was thinnest there was a nude spot at the point of attachment of the placental membrane, and near the external border other two bare places which were deeply concave and red-coloured, one having a slight eminence in the centre. The entire mass was soft and pulpy, as if the interior was composed of cells containing fluid. No traces of bone could be felt, and as it was decided to keep the specimen intact, nothing more of its structure was reported."

Uterine Kysts.—"Uterine kysts are pathological productions, somewhat analogous to the vesicular degeneration of the human placenta, in which the placental villi are distended with fluid, enlarged, elliptical, transparent, and loosely connected, while their vessels become obliterated and disappear. This constitutes what has been designated a 'vesicular mole.'"—*Fleming*.

An interesting case is mentioned by this author as recorded by Liautard in the *Journal de Méd. Vétérinaire de Lyon*.

Hydrops Uteri.—This condition has already been discussed in the chapter on "Diseases of the Generative Organs." It consists in an accumulation of fluid in the uterus, and may be the result of injury to the organ, disease, or associated with gestation. Ruinard says: "When this collection is forming, the abdomen gradually enlarges, as in ordinary gestation; the animal looks healthy, and

there is scarcely any difference between this state and that of pregnancy before the second third, or even the second half, of gestation. It is rare that these collections persist more than five or six months without being evacuated at least once, and it is

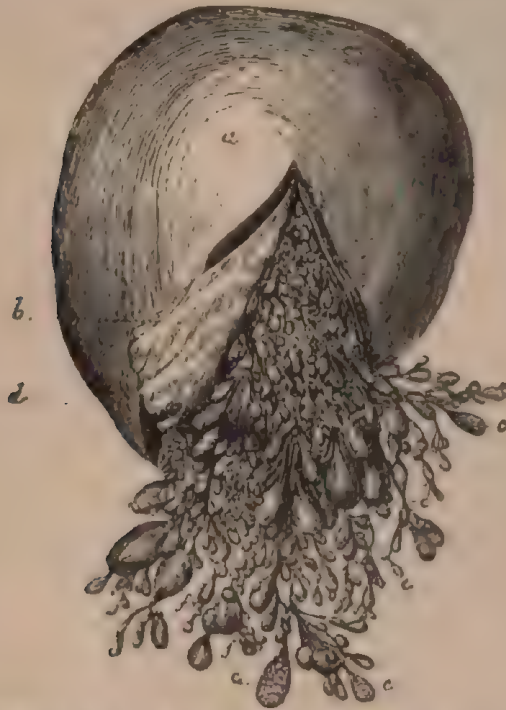


Fig. 71.—Hydatid Kyst or Mole: Human. The kyst which filled the uterus has been opened, and gives exit to a number of hydatid vesicles. The section shows two membranous layers, the first of which, *a, a, a*, is external, and is analogous to the epichorion, or decidua; while the second, *b, b, b*, is a fine transparent membrane, apparently the remains of the chorion; *c, c, c*, granular vesicles; *d, d, d*, white vesicles, some of which appear on the surface as granulations, and others act as pedicles to the globules at their extremity; *e, e, e*, oblong vesicles which appear to be constricted or dilated vesicles; *f, f, f*, budding vesicles.—*Boivin*.

usual to see this evacuation take place every month, or at least every two months. The fluid is greyish-coloured, and it is often as much as an ordinary bucketful."

Free Martins.—When twin calves are born of both sexes the female is usually unfertile, and has received the designation "Free Martin." Unless, however, the animal is an hermaphrodite it by no means follows that it should be sterile. On the contrary, numerous instances are on record of the twin female breeding. The male is seldom infecund. Baumeister nevertheless gives an instance in which a bull—a twin—was put to a hundred cows, none of which produced a calf.

IMPOTENCY AND STERILITY.

Impotency in the lower creation is a subject which has rarely found a place in Veterinary literature, and it is certainly true that such a condition is comparatively speaking seldom found to exist in the domesticated animals, and especially the bovine species; nevertheless it is ascertained that these, more particularly the male sex, are sometimes impotent; and the causes which give rise to this state are similar to those existing in human beings—viz., a highly nervous temperament, debility, unhealthy system, overtaxing the generative organs, urethral disease, congenital malformation, or imperfect development of the organs, vaginal adhesions or tumours, disease of the os uteri, etc.

Sterility or infecundity is not at all uncommon in the bovine species; but it is more often of a temporary than a permanent character, and it is rarely that the agriculturist waits to determine the latter in the female. Having missed successful copulation, fattening or sale is usually resorted to. Sterility is dependent on much the same causes as impotency. Mestivier gives the causes of sterility as follows:—

- " 1. Deficiency of sexual organs entirely or partially.
- " 2. Defect of conformation of the organs.
- " 3. Unusual proportion, either greater or less.
- " 4. Excess or deficiency in action.

" The uterus sometimes does not present any opening. A foreign body may also close the orifice of the uterus, or the orifice may deviate to the right or left. Hysterocele. A foreign body in the

uterus itself. Obliteration of the Fallopian tubes, diseases of the ovaries; obliteration of the bloodvessels which are distributed to them."

Dr. Wilson* observes:—"A little reflection will be sufficient to indicate the general distinction which exists between the last-named malady and the one we are now about to examine. Any obscurity that may happen, will most likely arise from the very close approach that some of the physical phenomena of impotency make to sterile conditions; and, indeed, the difference in some instances is not at all apparent, if merely indicated by description. Thus if there be any impediment that renders the communication between the male semen and the female ovum impossible, that would be an effectual bar to the power of fecundation, even though the individual in whom this impediment actually exists may not necessarily be sterile.

"Impotency, as I have pointed out, consists of any positive obstruction to the arrival of the semen at the ovum, whether it arise from male or female causes.

"Sterility in man is a condition of morbid change, under which the elements of fecundation are imperfectly developed, as the result of disease in the functional structures from which they are secreted, and, consequently, a deficiency in vitalizing principle, on which the reproducing faculty depends; or it may arise from the destructive effects occasioned by mal-secretion in the passages through which it has to progress.

"In the female, it consists of an incapacity for permitting the vital activity to be established in the structures to which the fertilizing fluid is applied; or of diseased secretion in the organs of reception, by which its influence is neutralized.

"No doubt it is very difficult, if not impossible, in cases where these changes are barely enough to produce sterility, to demonstrate the faulty secretion upon which the diseased condition depends; but where serious organic changes have taken place, the task is more easy.

"If, for instance, it could be shown that any one component portion of the semen were wanting, then would there remain no uncertainty in ascribing the lost power to its true point of origin;

* "Diseases Impeding Reproduction in the Male and Female."

and, therefore, an accurate discrimination is required to ascertain if such a fact is in existence.

"So long as sterility depends merely upon depression of vital force in consequence of certain temporary constitutional changes, there is a reasonable prospect of success, by pursuing a proper mode of treatment; but when it arises from some physical alteration of the secretions, caused by a morbid change in the structures whence they are derived, the chances of relief are very considerably diminished.

"The first steps of inquiry are naturally directed to the semen; and in the production of this secretion it is possible to demonstrate a deficiency of spermatozoa. That circumstance may happen from an unhealthy condition of the testicular secretion unfitting it for the generation of these vital fibrillæ; while cases occur in which the secretion is so hurtfully altered as to cause their destruction immediately after they are disclosed from their ova. Most probably, also, the generative principle itself is liable to vitiation; but as there are no evidences, either physical or otherwise, upon which that quality is known to depend, neither is there any mode at present of proving the fact.

"In excited action of the tubuli of the testes, there may exist an amount of spermatozoa equal in point of numbers to those observable in an ordinary emission, while the other components of the testicular secretion may be produced in such abundance as to render their quantity quite insufficient for impregnation. Irregularities of this kind are very difficult of treatment.

"Absorption of the testicles themselves may likewise take place; and, of course, over such a cause of sterility treatment has no probable chance of giving relief. The result in all these instances is identical.

"The mucus of the vasa deferentia may also act as a means of sterility, by alterations occurring in its composition, in consequence of inflammation or other disease in any part of their long course, etc., etc.

"In females there is the same complexity and diversity of conditions of disease as in the male. While some of the forms admit just as little of remedy.

"When the question of sterility in a female first requires to be considered, the points to which our attention should be chiefly directed are the ovaria, because, as they contain the special elements

which at a future time are to become fertilized, and are indeed the field from whence the ova spring, it is quite clear that any abnormal action established in them would jeopardize, if not entirely destroy, the great function of fertility.

"The ova themselves are also liable to changes, independent to some extent of the ovaria in which they are produced, and are not exempt from conditions of disorder that unfit them from responding to the influence of impregnation. This unfitness may depend upon a deficiency of sensitiveness, whereby fecundation cannot be established; or the activity of the structures may be in such excess, that the vitality is destroyed as it were by its own impetuosity.

"It is seldom that these special conditions can be sufficiently distinguished, to be submitted to treatment, without some uncertainty; but should symptoms arise indicating with clearness the peculiar states of the organs, then treatment becomes admissible, although it must be directed chiefly through the general constitution, in an endeavour to subdue the nervous irritability on which they depend. If, as sometimes happens, pain is perceived in the situation of the ovaries, either when submitted to external pressure, or from a dull persistent uneasiness, we may rely confidently on treatment by counter-irritation and on antiphlogistic remedies.

"There are certain circumstances of a structural character which appear to arrest development in the ovaria at the commencement of life, and in such instances these organs remain entirely absent. They may, on the other hand, go on developing in an equal ratio with the other organs, up to the time of puberty, when their further progress may become arrested; or, having arrived at the stage of full formation, absorption of their mass may occur as the result of some serious lesion happening in other structures.

"If the conditions of the ovaria mentioned above—that is to say, those arising from organic errors—exist, all treatment is useless; and if the fact of the deficient ovaria could be ascertained, it would be wrong to run the risk of injuring the constitution by the administration of any special medicines whatever.

"The maladies of the uterus and vagina are more readily brought under control; and when it is perceived that the injurious conditions depend upon chemical alteration in the secretions of the organs, they may be submitted to treatment with some hope of success.

"The sterile effects are not so absolute in diseases of the latter organs, as in those of the ovaria, because they much less frequently arise from any serious organic changes, but are dependent rather upon alterations of functional action, usually of a temporary character, and more or less amenable to treatment. The fact of these structures being simply the means of giving passage to the more physiological results of the venereal act, has, no doubt, its weight in nature's great motives, although it must be admitted that their own particular influences are often sufficiently malign effectually to impede the chances of impregnation."

Occlusion of the *os* or mouth of the uterus has been long known as a cause of sterility in the cow. "This occlusion," observes Fleming, "may be complete during coition, and prove fatal to conception; it may be due merely to a spasmodic condition of the muscles of the cervix. The oiled hand should be introduced into the vagina to ascertain the state of the part; when, if the closure is suspected to be owing to muscular defect, the cervix may be smeared with extract of belladonna. If, however, this does not succeed, or if there be hypertrophy, disorganization, or rigidity, then an operation will be necessary. Hypertrophy from plastic exudation, and the formation of false membranes, is a frequent cause of sterility, and usually occurs during or after the first birth, particularly in the cow. In many cases the morbid closure of the *os* can be remedied in a very safe and simple manner. The animal is secured—if a mare by the 'side-line,' if a cow by fastening the two hind-legs together, though not too close—and the oiled hand, in the form of a cone, passed up the vagina to the cervix in a half-rotary or screwing manner; on reaching this, the tips of the fingers are to be gently insinuated, by the same movement, into the *os*, and pushed on until the cavity of the uterus is reached. A simple sound, well greased, and the size of an ordinary catheter, may be employed with the same object as the fingers, and appears to answer quite as well. Various instruments have been devised to dilate the cervix, but nothing is equal to the fingers or the sound. The animal may be put to the male on the same or the following day. This simple operation for the cure of sterility has been very often practised, and is well known to the Arabs of Sahara, who treat their barren mares in this manner, and in the majority of cases with success."

CHAPTER XII.

PARTURITION.

Normal Parturition.—Abnormal ditto.

NORMAL PARTURITION.

By normal parturition is understood the natural expulsion of the foetus at full term—*i.e.*, when the birth is accomplished without artificial aid. The most complete description of this process in Veterinary literature is given by Mr. Fleming, in the obstetrical work already alluded to; and being in all details accurate so far as science has gone, I propose transcribing, with abbreviations, therefrom, referring my readers who desire a more exhaustive treatment of the subject to the original.

Physiology of Parturition.—"The act of parturition, notwithstanding its special object, is distinguished from all other physiological acts or functions by certain peculiarities; for while the latter are normally accomplished without disturbing in any way the well-being of the individual, parturition, on the contrary, even when natural, is accompanied by pain, general disturbance and uneasiness, and violent efforts. And during birth nature does not appear to obey those immutable laws so strictly as in the accomplishment of the other physiological acts, but makes frequent and wide deviations; though these do not often compromise the final result. We never find two births exactly alike, but each offers something peculiar when attentively observed. We need only refer to the duration of the act as a whole, as well as to each of its periods or stages."

Causes of Parturition.—"When the period of utero-gestation is full, certain alterations, uterine and otherwise, take place, causing the uterus to contract upon and expel its contents. "The blood which was sent to the organ is now diverted towards the mammae, for the secretion of milk; the exchange of materials between the uterus and the foetus is lessened, and the latter becomes like a

foreign body in the cavity of the former. But to obtain a reflex action, and consequent contraction of the uterine muscles, as Schroeder observes, a certain amount of continuous irritation is necessary. This sum once obtained, a reflex action takes place in the form of a contraction, which, however, is slight at the beginning. Then a pause follows, until the sum of the irritation is again sufficient to cause a contraction. By the increase in the intensity of the contractions the uterine wall is removed from the envelopes, and this separation becomes a new source of irritation to uterine nerve-fibres. The reflex action, in the form of labour-pains, becomes more and more powerful, until these follow at last in rapid succession, and complete the expulsion of the ovum.

The Expelling Powers.—"The expulsive force by which parturition is effected resides in the unstriped muscular fibres of the uterus, which cause the organ to contract in a rhythmical and somewhat peristaltic manner, the contractions of the abdominal muscles and diaphragm being merely auxiliary. These contractions of the uterus may take place although the organ does not contain a fœtus, and have been noted in extra-uterine pregnancy, when they probably occur through sympathy. They have been observed in the false gestation of the bitch which has not really conceived, but whose mammae enlarge, and which makes its bed and exhibits other indications of approaching labour; as well as in pregnancies prolonged beyond their ordinary limit.

"As the uterine contractions which lead to expulsion are usually accompanied by a painful sensation (due to pressure on the nerve extremities), they are designated 'labour-pains' (*dolores ad partum*).

"Expulsion is effected by a series of contractions, with an interval of apparent repose between each, during which the organ seems to be gathering strength for a new effort.

"As parturition progresses, the contractions become more frequent, stronger, and of longer duration.

"During each regular pain the whole of the uterus contracts, though the fundus does so most energetically, and the longitudinal fibres of the organ are more particularly brought into play at the initial and middle stage of parturition. The cornua likewise contract, are twisted on themselves anteriorly, are shortened through the action of the longitudinal fibres, and are brought nearer the body of the uterus, which is also shortened; and as this shortening

is always taking place in the direction of the cervix, it is here that the sum-total of the expelling force is centred; and it is this force, commencing to operate at the fundus of the organ, and exerted on the incompressible liquor amnii, which gradually opens the os for the extrusion of the fetus.

"When twin parturition sets in, the uterine contractions commence almost simultaneously in both cornua; but as the two fetuses cannot be born together, that which is most advanced is delivered first—the other, which is behind it, mechanically aiding in its expulsion. In the mare the interval between the birth of twins is rarely more than ten minutes; with the cow it may be one or two hours;* and with the ewe half an hour."

Symptoms and Course of Parturition.—"The entire period of labour is, for facility of description and study, divided into a certain number of stages or periods—usually three or four. These are: 1. *Preliminary stage*; 2. *Dilatation of the os uteri*; 3. *Expulsion of the fetus*; 4. *Expulsion of the membranes*.

"*Preliminary Stage.*—Various precursory signs announce the approaching termination of pregnancy and the advent of labour. These may be observed some hours, sometimes even for days, before that event occurs.

"One of the most important signs is the enlargement and increased sensibility of the mammae, to which the excess of blood no longer required in the uterus is directed. These glands become voluminous, hard, and tender; and this phenomenon is more particularly remarkable in those animals whose milk is not utilized after the young have been weaned.

"At a later period the teat yields a serous fluid on pressure, or this constitutes a crust around it; this fluid afterwards becomes somewhat lactescent, and finally appears as the 'colostrum,' or first milk.

"Another premonitory sign is the tumefaction of the vulva, increase of space between the labia, which become soft and flabby, while their lining membrane is reddened, and a viscid, glairy mucus covers it. This mucus, derived from the vaginal lining membrane, soon becomes so abundant that it is discharged in long filamentous streams, particularly in the cow, and soils the tail and

* I have known many hours to elapse between the first and the second birth in the cow.—J. W. H.

hocks. It is destined to lubricate the genital passages, and facilitate the extrusion of the foetus.

"With these changes the abdomen falls, or rather becomes more pendent. The croup looks hollow, as do the flanks, due to the relaxation of the broad ligaments. The spine, particularly in the lumbar region, becomes more horizontal and rather inclines downward, as if yielding to the weight of the abdomen. The haunches appear to be wider apart, and the gluteal muscles to subside, owing to the falling in or modification of the sacro-ischiatic as well as the sub-ischiatic ligaments, from serous infiltration.

"The animal walks sluggishly and unwillingly, and if grazing with others, does not appear to care about following them. Sometimes, as has been mentioned, there is swelling of the limbs, particularly the hind ones.

"If very careful vaginal exploration be made at this time, it will be found that the cervix uteri has become a part of the uterine cavity and is almost completely effaced, being reduced to merely a thin circular ring; its tissue is soft, and the os is slightly open in those animals which have previously had young.

"As parturition draws nearer, these phenomena are more marked. The animal also begins to be restless, and continually agitated. If feeding, it stops for some moments, as if listening to some sound only audible to itself, or as if experiencing some strange internal sensation for the first time, and which may certainly be the preparatory or commencing contractions of the uterus. Not unfrequently the animal lies down and gets up again, as if suffering from colic. Some are quite mute, though anxious and uneasy; while others, in addition to exhibiting restlessness and distress, utter a half-stifled cry of pain. If the animal is at liberty, it seeks a remote and quiet place in which to bring forth its young.

"*Dilatation of the Os Uteri.*—The limit between this stage and the former is not so well marked as our division would indicate. Nevertheless, it is meant to imply that the stage of dilatation of the os terminates pregnancy and ends with complete extension in width of that uterine passage. It is marked by increasing uneasiness of the animal—pawing, lying down and rising frequently in a kind of objectless fashion, while the expression of the physiognomy betrays suffering. When the uterine contractions really commence, the creature suddenly stops, as if surprised by the pain; its eye

looks animated, and expresses anguish; the skin is hot, pulse quickened, visible mucous membranes injected; the abdominal walls are rigid and contracted, the flank is tense, and very frequently fæces and urine are voided. During this pain, if the cervix uteri is explored, it will be found that its attenuated border has a tendency to become hard and prominent. When the pain has passed, calm succeeds; the cervix becomes thick and elastic, and the os is markedly enlarged. Each pain lasts from some seconds to two or three minutes, the interval of quiet continuing to about fifteen minutes at first, though it diminishes when the contractions become more frequent, more energetic, and more prolonged, and dilatation of the os progresses.

"Then the foetal membranes begin to be detached from the inner surface of the uterus and enter the os, whence they pass into the vagina and between the labia of the vulva, where they appear externally as the 'water-bag.' In the meantime, the fore-limbs and the nose and head of the foetus enter the os, and dilate it to its fullest extent, when the cavity of the uterus forms a canal continuous with the vagina.

"*Expulsion of the Foetus.*—The pains become more severe, frequent, and sustained, and to the uterine contractions are added those of the diaphragm, and abdominal and other muscles. If the animal is standing, it brings all its limbs under the body, arches the back, elevates the tail, slightly flexes the hocks, makes a deep inspiration, closes the glottis to imprison the air in the chest, and by a powerful contraction of all the muscles of the trunk, it brings such an amount of pressure to bear on the foetus as to propel it into the pelvic cavity, and rupture the chorion. At each contraction the 'water-bag,' formed by the allantois and amnion, protruded beyond the vulva, increases in volume. It varies in different animals, being in the cow about as large as the bladder of a pig. When it is very large in advanced parturition, it is reckoned a good sign, though it may not indicate a good presentation of the foetus, nor an easy birth.

"The position assumed by animals during parturition is somewhat variable. The larger animals, which usually only bring forth one at a birth, such as the mare, cow, and sheep, ordinarily do so standing; and this position has the following advantages: the vertebro-sacral angle is effaced, and the obstacle that its projection might offer to the passage of the foetus into the pelvis is diminished;

the auxiliary muscles—abdominal and diaphragmatic—can act more energetically; the young creature being sustained by the umbilical cord when it has cleared the vulva, glides gently on the half-flexed hocks of the parent, and so reaches the ground without injury. (Fig. 70.)



Fig. 72.—Cow in the act of Parturition : Standing position.—*Fleming.*

"Such an attitude, however, is far from being common with these animals; and very often, especially with the cow, they bring forth in a reclining position, maintained from the very commencement of the act, and only rising when birth is completed.

"The animal rests on the sternum, the body inclined to the right or left side, the fore-limbs flexed beneath the chest, and the hind ones beneath the abdomen. In this attitude labour is carried on somewhat as when standing. The creature reclining on the breast and partially on the quarter, arches the back in straining, slightly raises itself on the hind-feet, and drops again when the pain has subsided.

"It is rare indeed that these animals lie full length on one side of the body during parturition, and when it does occur it nearly always indicates a long, difficult, exhausting labour."

Expulsion of the Membranes.—The expulsion of the foetal membranes, or "after-birth," may occur at birth, immediately after, or be delayed for a variable period; this depending not only upon accidental circumstances and individual peculiarities, but also upon species, and consequently the placental connections.

"Immediately after the foetus is expelled, the uterus contracts energetically on itself, and its internal capacity rapidly diminishes; consequently, the placental villousities are detached from their alveoli, the uterine and chorionic surfaces become wider apart, and the

placenta is ultimately separated from the uterus. The same contractions which loosed them, are also instrumental in forcing the membranes through the gaping flaccid os into the vagina; and the auxiliary muscles, being again stimulated by their presence here, as they were by the head of the fœtus in the same passage, add their powerful contractions, so that these new pains, aided by the physical weight of the extruded portion with its appended umbilical cord, soon bring the whole mass away. The contractions of the vagina have probably little, if anything, to do with this expulsion, which is rarely followed by hæmorrhage in animals; though in woman, owing to the inertia of the uterus, this accident is not at all uncommon. Sometimes the expulsion of the membranes is expedited by the young creature, as it descends from the vulva.

"With the cow, because of the multiple placentulae, the number of which may be over a hundred, the adhesion between the uterus and fœtal membranes is very intimate; while the small volume of the cotyledons offers but little surface for the uterine contractions to act upon. So that while it happens that the calf is never born in its intact envelopes, it also occurs that the after-birth is only slowly and tardily extruded; two, four, or more hours, or even days being required; and, indeed, it is not at all rare for retention to take place in this animal, and the envelopes require to be removed artificially."

Fleming, for convenience, gives the following table of different presentations and positions.

PRESENTATIONS AND POSITIONS OF THE FÆTUS.

Anterior Positions	{	1. Vertebro-sacral.
			2. Vertebro-pubic.
			3. Right Vertebro-ilial.
			4. Left Vertebro-ilial.
Posterior Positions	{	5. Lumbo-sacral.
			6. Lumbo-pubic.
			7. Right Lumbo-ilial.
			8. Left Lumbo-ilial.
Dorso-lumbar Positions	{	9. Right Cephalo-ilial.
			10. Left Cephalo-ilial.
			11. Cephalo-sacral.
Sterno-abdominal Positions	...	{	12. Right Cephalo-ilial.
			13. Left Cephalo-ilial.

ABNORMAL PRESENTATIONS.

When, owing to the false position of the foetus, or from certain conditions of the same, birth is not accomplished without mechanical aid, artificial measures become necessary.

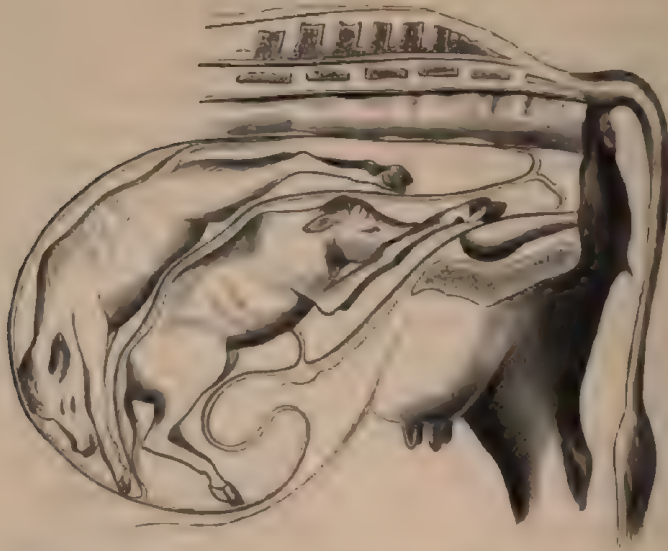
1. *Twin Presentation.*

Fig. 73.—Twin Foetuses, in different presentations, passing into the genital canal.—*Saint-Cyr.*

Delivery.—Disengagement of interlocked limbs, the return of one foetus (the lower and most backward) into the uterus during the extraction of the other.

2. Fore-limb Crossed over the Neck—Fig. 74.

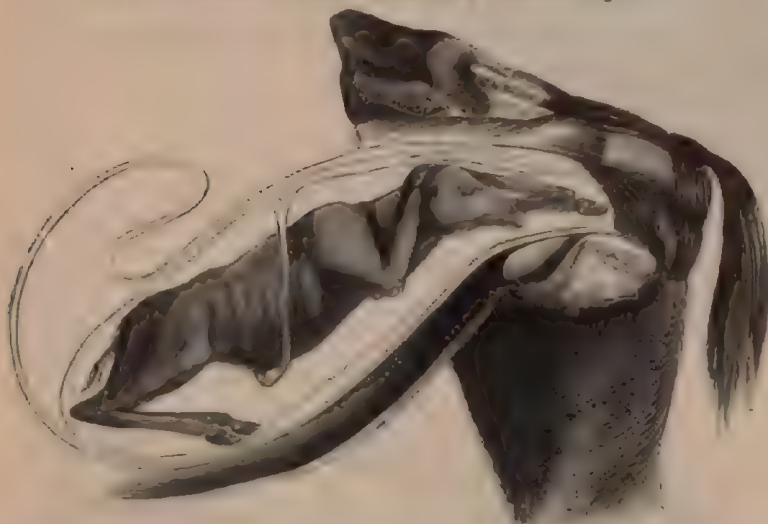


Fig. 74.—Anterior Presentation: Fore-limb crossed over the neck. Mare. Same complication is met with in the cow.—*Saint-Cyr.*

Delivery.—Taking hold of the fetlock, raising it, pushing gradually backwards so as to flex the knee, and inclining the limb to its proper side. Then extend it, and, if necessary, assist birth by traction on both fore-limbs.

3. Fore-limbs Bent at the Knees—Fig. 75.



Fig. 75.—Anterior Presentation: Fore-limbs bent at the knees.—*Saint-Cyr.*

Delivery.—Having secured the head, return it back to the uterus; then seek for the fore-arms, and extend the limbs in what should be their normal position.

4. *Fore-limb completely Retained—Fig. 76.*

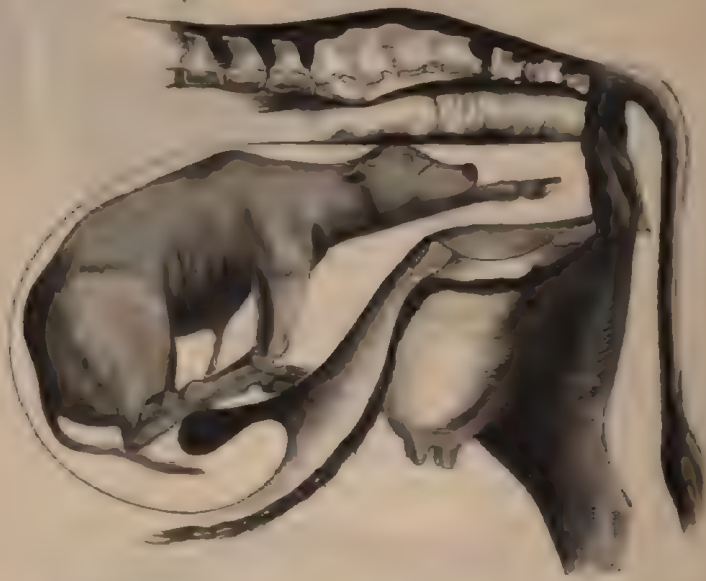


Fig. 76.—Anterior Presentation: One fore-limb completely retained.—*Saint-Cyr.*

Delivery.—As in the former. Exceptional cases have required amputation at the shoulder, whilst others have yielded to traction on the head and presented limb. In the retainment of both fore-limbs the treatment is the same, but delivery is extremely difficult and seldom accomplished.

5. *Deviation of the Head—Fig. 77.*

Fig. 77.—Anterior Presentation : Extreme downward deviation of the head.
Saint-Cyr.

Delivery.—The passage of the hand between the fore-limbs, down the face of the fetus to the nose, which should be firmly drawn upwards, and brought into the genital canal. Failing this, a cord may be attached to the upper jaw, and traction applied, whilst the upper part of the head is being pushed backwards, or, in urgent cases, a hook may be fixed in the lower jaw, or, if the head is considerably doubled back, within the orbits.

6. *Deviation of the Head—Fig. 78.*

Fig. 78.—Anterior Presentation : Lateral deviation of the head towards the shoulder.—*Saint-Cyr.*

Delivery.—Secure the feet and head with a cord round the former, and the lower jaw of the latter. Apply traction on the rope of the jaw, at the same time backward pressure to the chest. If these measures fail in bringing round the head, the blunt crotchet may be fixed in the orbit and traction exercised on that part : failing this, the methods adopted by Schaack, and Delafoy, as described in Fleming's "*Obstetrics*," may be employed. Injections of warm water and oil if the genital passage is dry, will facilitate the birth ; or, as a last resort, embryotomy.

7. Deviation of the Head—Figs. 79, 80.

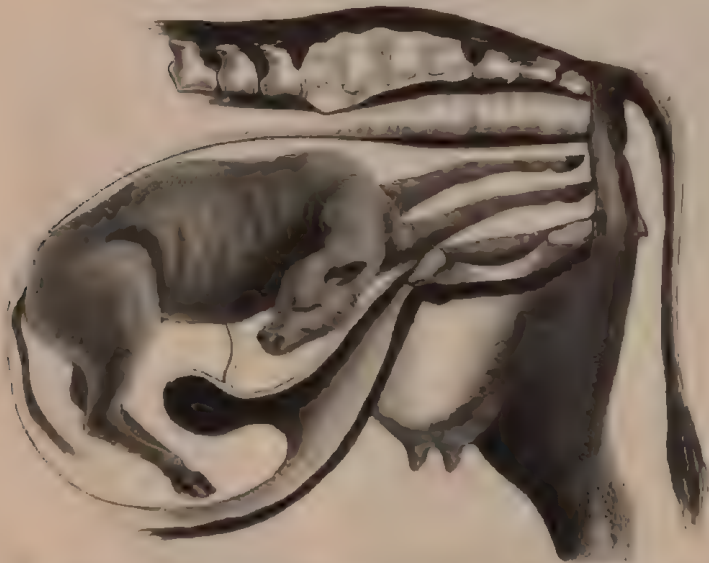


Fig. 79.—Anterior Presentation : Lateral deviation of the head towards the abdomen.—*Saint-Cyr.*

Delivery.—As in the two preceding forms.

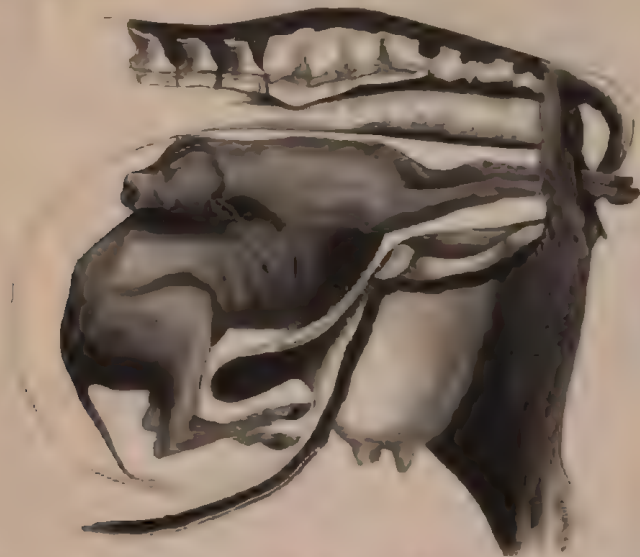


Fig. 80.—Anterior Presentation . Deviation of the head upwards and backwards.—*Saint-Cyr.*

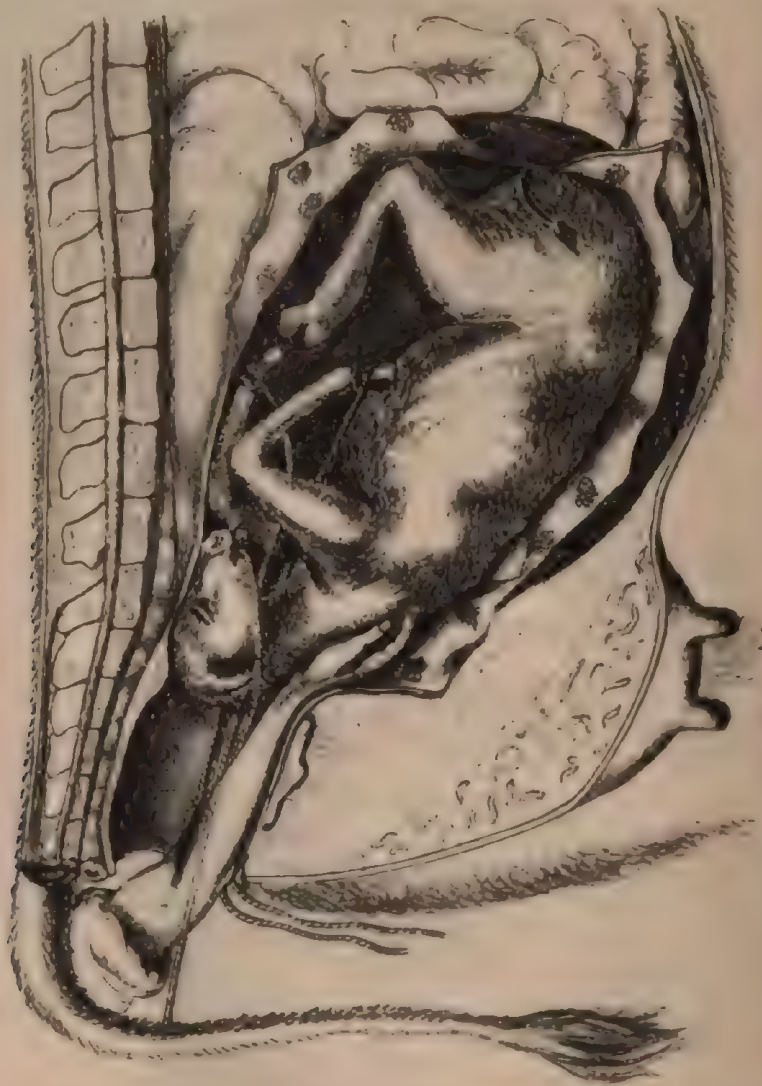
8. *Reverse Anterior Presentation—Fig. 81.*

Fig 81.—Fœtus on its back, with nape of neck presented.—Simonds.

Delivery.—Turn the fœtus if possible. Noose the lower jaw and fore-feet. Apply pressure to the withers, whilst traction is employed on the limbs; if applied to only one of the latter, the calf may gradually turn on itself. If delivery cannot be thus accomplished, embryotomy is indicated.

9. *Posterior Presentation.*



Fig. 82.—Lumbo-sacral Position : Hind-limbs presented.—*Saint-Cyr.*
Delivery.—Traction without alteration of position.

10. *Posterior Presentation*—Figs. 83, 84.

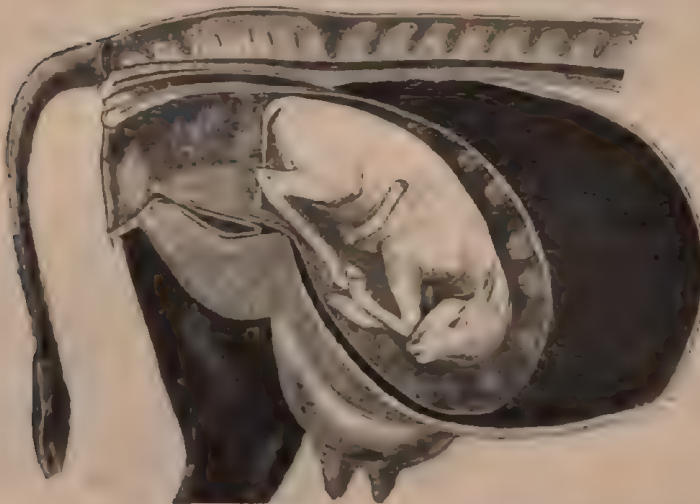


Fig. 83.—Hock Presentation. —*Franck.*

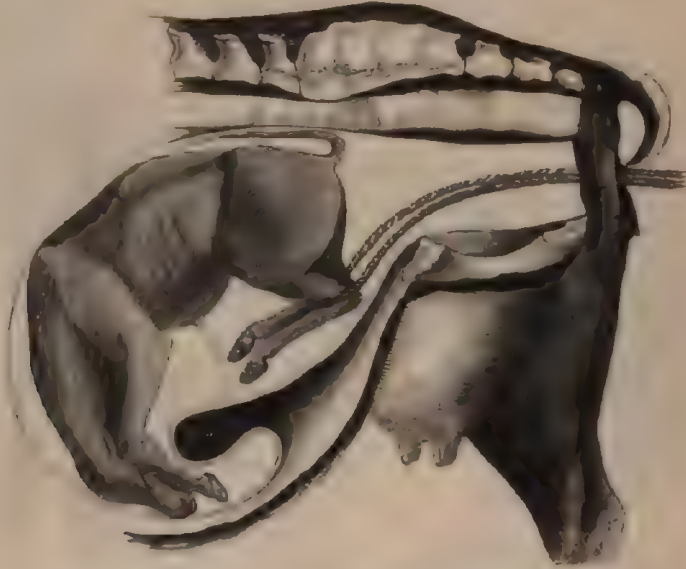


Fig. 84.—Hock Presentation : Hock corded.—*Saint-Cyr.*

Delivery.—Having returned the foetus in the uterus to a sufficient extent to reach the limbs, pass a cord round the hocks, and draw them forward ; then pass the cord down below the fetlocks, push the foetus still more forward into the uterus, at the same time applying traction to the fetlocks, when the limbs will usually come straight into the passage, and delivery may be accomplished as in the preceding form.

11. *Posterior Presentation*—Figs. 85, 86.

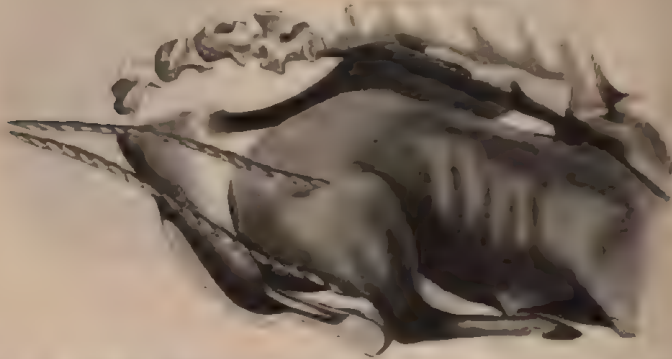


Fig. 85.—Thigh and Croup Presentation : Thigh corded.—*Saint-Cyr.*

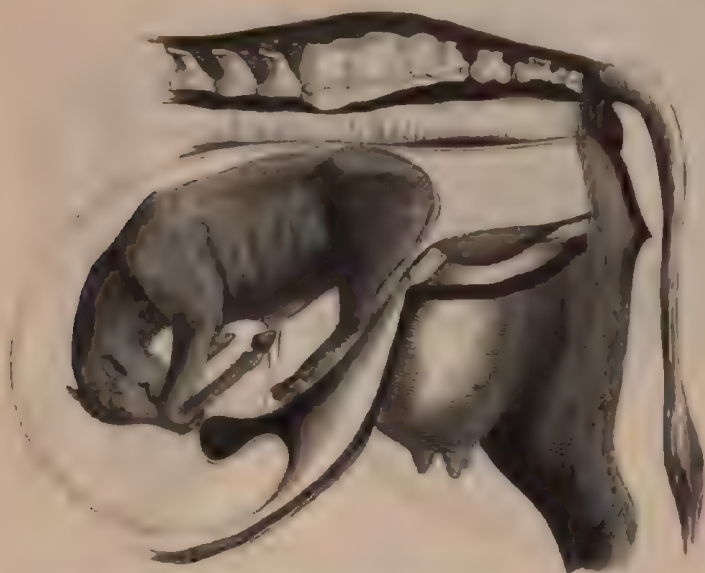


Fig. 86.—Thigh and Croup Presentation : Breech.—*Saint-Cyr.*

Delivery.—Push the fetus well forward, pass a cord round the thigh, flex the limb as much as possible, so as to get the hock, and following it the foot, up; and still pushing the breach forward, employ powerful traction on the limbs. Success not resulting, the methods adopted by Lequoc and Saake, as described in Fleming's "Veterinary Obstetrics," may be tried.

12. *Sterno-abdominal Presentation*—*Figs. 87, 88.*



Fig. 87.—Schack's Halter placed on a calf's head, the right fore-paster being also corded.—*Saint-Cyr.*



Fig. 88.—Sterno-Abdominal Presentation : Head retained.—*Saint-Cyr.*

Delivery.—Having distinguished the limbs, they should be secured, and, by Fleming's advice, the cords specially marked by coloured tape or knots ; so that the operator may see which are the hind and which are the fore legs.

The hind-quarters are then to be brought towards the inlet, converting the position of the fetus into that shown in Fig. 82, and delivery proceeded with.

Regarding obstetrical operations and the mechanical means for



Fig. 89.—Obstetric Pulleys.—*Saint-Cyr.*

the extraction of the foetus, the various instruments, as cords, bands, head-collars, forceps, crotchets, embryotomy knives and saws, and

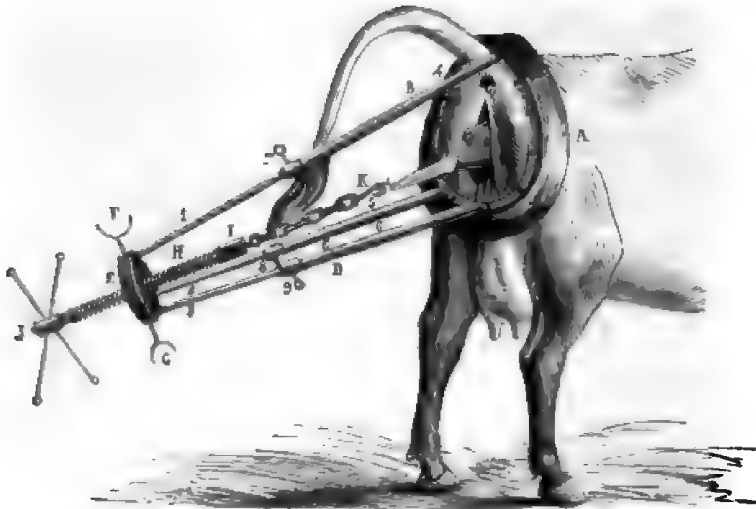


Fig. 90.—Baron's Obstetric Machine.—*Saint-Cyr*.

pully-blocks, are all ably figured, and their methods of application described, in Fleming's exhaustive treatise on "Obstetrics."

Of head-appliances perhaps Schaack's is the best adapted.

With regard to traction machines, the obstetric pulleys in Fig. 89, by Saint-Cyr, and Baron's obstetric machine, portrayed in Fig. 90, have been spoken most highly of.

CHAPTER XIII.

DISEASES OF THE FŒTUS.

Hydrocephalus.—*Ascites.*—*Anasarca.*—*Hydrothorax.*—*Emphysema.*—*Poly-sarcia.*—*Contractions.*—*Tumours.*

HYDROCEPHALUS.

Hydrocephalus.—(from ὕδωρ, water; κεφαλή, the head) is a dropsical condition of the brain, usually arising from malformation of the organ, or deficiency of some of its parts. In the bovine species it is most frequently congenital. The quantity of serum collected is variable, as also its situation. At times the cranium attains an enormous size, and assumes extraordinary shapes (Figs. 91, 92); whilst at others the bones become but little dis-



Fig. 91.—Calf affected with Hydrocephalus.—*Rueff-Baumeister.*

tended. "Owing to the great development of the forehead the upper jaw appears to be shorter than usual; and, indeed, it will be found that it is really so."—*Fleming.* (Fig. 93.)

This serous effusion takes place in one or both ventricles, and

has been supposed by some authorities to be the result of chronic inflammation of their lining membrane. When but one ventricle is affected, an unequal elevation will be the result; on the other hand, if both ventricles are involved, and to the same degree, the distension will be even in volume, and more or less protuberant according to the amount of fluid secreted. In some cases the quantity is so excessive and the pressure so great, that the unossified sutures of the cranium become pushed widely apart, exposing the protection of simply the dura mater; while the most expanded parts of the skull are of transparent thinness.



Fig. 92.—Hydrocephalic Calf.—*Fleming*.

Hydrocephalus is said to be *external* when the dropsy occurs in the arachnoid sac—between the arachnoid and dura mater—or between the dura mater and cranium, and according to the locality of the fluid, will the abnormal conditions vary. When the accumulation takes place within the ventricles, distension of the brain till it becomes like a membranous sac is the result. On the other hand, outside compression will reduce the brain in bulk.

Diagnosis.—In congenital hydrocephalus, manipulation in an anterior presentation will at once reveal an hydrocephalic condition. In the case of malpositions or posterior presentations, this condition is not easy of diagnosis, except in those cases where the

cranial volume is so excessive that it may be ascertained per rectum, or through the abdominal walls.

Treatment.—The treatment of congenital hydrocephalus will depend much upon the extent of the effusion, consequent deformity, and obstruction to the birth of the fœtus. When traction is not sufficient to accomplish delivery, tapping or puncture by



Fig. 93.—Skull of a Hydrocephalic Calf : Cranial bones partially destroyed and defective.—*Saint-Cyr.*

means of a trochar and canula should be resorted to, the softest part being selected for the operation. Prior to puncturing, the feet should be secured by cords and returned into the uterus, and the head brought forward against the brim of the pelvis by orbital hooks. (Fig. 94.) In the case of posterior presentation, the cranium may in like manner be punctured at the back.

ASCITES, ANASARCA, AND HYDROTHORAX.

The effusion of fluid during fetal life within the abdominal cavity (ascites), underneath the skin (anasarca), or in the chest (hydrothorax), are, compared with hydrocephalus, rare conditions. Ascites is the most frequent of the three, and this is often associated with hydrothorax.

Causes.—These dropsies, though not altogether satisfactorily accounted for, are most probably due to parental conditions, as scrofula, uterine dropsy, hydræmia, or debility arising from various other maladies, notably those of the liver and kidneys.

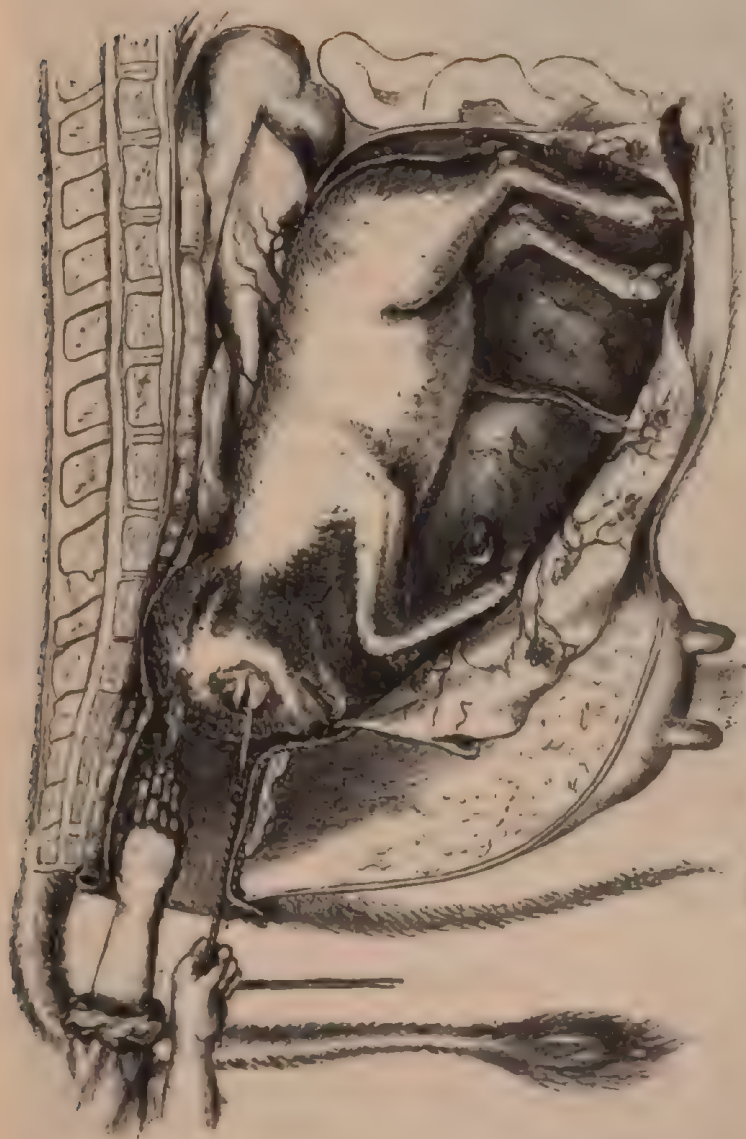


FIG. 94.—Congenital Hydrocephalus : Puncturing. — *Simonds*.

Franck observes ("Handbuch der Thierärztlichen Geburtshülfe," p. 429), from the fact that sometimes a cow will for a number of years bring forth these dropsical calves in succession, while other cows in the same shed produce healthy calves, shows there is in these cases some anomaly in the uterine vessels; and that with anasarca and ascites there are rachitic alterations of the bones, points also to mal-assimilation, or deficient supply of the protein substances and phosphorus salts, the deficiency being presumably due to disease on the part of the mother, or to some anomaly in the composition of the uterine milk.

Diagnosis.—A vaginal or uterine exploration will usually suffice to reveal a dropsical foetus, particularly if ascites exists, when the abdomen will be found unusually large and distended, soft and fluctuating. While in anasarca the body has a puffy feel, as though the skin were blown out. In either condition there is an increase in the size of the mother, giving the appearance of multiple calves.

Treatment.—Not unfrequently from its blocking up the passage, and more or less filling the pelvic cavity, it is impossible to pass the hand, and removal of the fore-limbs by embryotomy in order to reduce the volume becomes necessary.

If traction is insufficient to procure the birth of the foetus, evacuation of the fluid by puncturing the cavity either through the chest into the abdomen, or through the abdominal walls, should at once be resorted to. (Fig. 95.)

Anasarca indicates external incisions on such parts of the body as are accessible.

Seven interesting cases by Rouchon, Courjon, Schwartz, Voiglander, Muller, Gierer, Dinter, and Binz, are recorded in Fleming's "Obstetrics."

EMPHYSEMA.

Emphysema, or the elimination of gas in the subcutaneous connective tissue of the foetus, occasionally operates as an obstruction to birth. As in anasarca, deep scarifications are to be made in the skin, and birth accomplished by traction, after first lubricating the genital organs of the mother with oleaginous agents. These measures failing, embryotomy is to be resorted to.

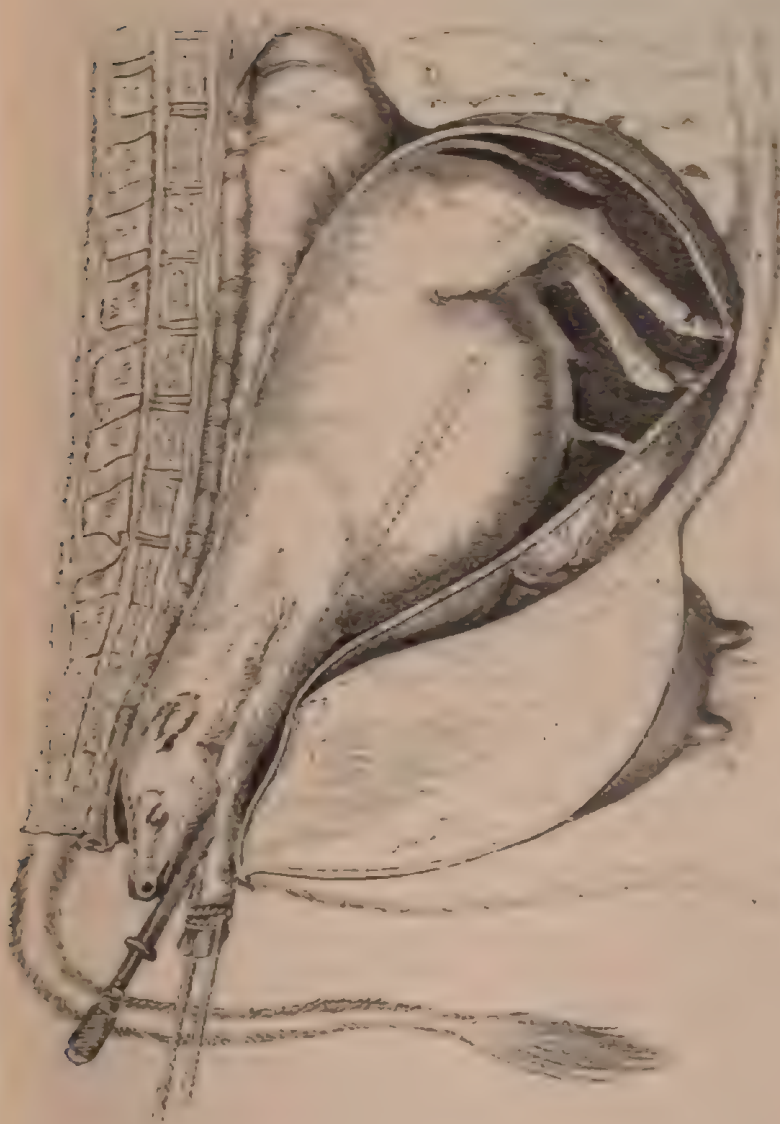


Fig. 95.—Puncturing abdomen through chest for dropsy. *Simonda*

POLYSARCIA.

This condition consists in abnormal accumulations of fat in the subcutaneous connective tissue. Animals so affected are termed in Germany "lard calves." They sometimes attain an enormous size, and from their bulk offer more or less obstruction to parturition, their extraction frequently necessitating embryotomy.

CONTRACTIONS.

Various kinds of distorted positions, arising from contraction or rigidity of certain foetal parts, are met with in obstetric practice. The neck and limbs are usually affected; the first being rigidly curved, and the latter abnormally flexed. Different opinions have been expressed as to the cause of these distortions, and the period of gestation at which they occur. Bouley puts it down to the *passive* influence of a false position maintained for a long time. Rainard to mechanical influences, as pressure on the foetus by the colon, particularly its pelvic position, when filled with hard fecal matter. Saint-Cyr and Rainard believe the deviation occurs early. Two interesting cases are recorded by Mr. Cartwright, of Whitchurch, in vols. xvi. and xx. of the *Veterinarian*.*

TUMOURS.

Various kinds of tumours situated external to or within the foetus may prevent birth; the former are usually unnatural ovules, which become self-grafted or adherent to the foetus. The latter are generally fluid tumours, and may be connected to various parts of the abdominal viscera, particularly the liver and kidneys.

Three cases of congenital tumour in the calf are recorded in Fleming's "Obstetrics."

* Delivery of a contracted foetus must be accomplished according to circumstances. Great care should be exercised in ascertaining the movability of the joints and extension of the limbs before commencing traction, otherwise laceration of the maternal genital organs may result. Embryotomy is frequently imperative, especially as regards the limbs; a division of the contracted muscles, tendons, or ligaments, permitting their extension, and the comparatively easy delivery of the foetus.

The first, described by Binz, was in the liver.

The second, by Lüdke, was on the neck of the calf, in the subcutaneous connective tissue, measuring more than a foot in diameter, and containing thirty-six pounds of yellow-coloured fluid in which was flocculent lymph. Delivery was accomplished and the cow saved by puncturing the tumour.

The third, by Rossignol, was attached to the umbilical region, and for some time strongly opposed the birth of the calf, until traction was resorted to sufficiently powerful to tear the body from its attachment, after which it was expelled by the cow. The tumour was spheroidal in shape, white, hard, and nodulated, and appeared to be composed of fibro-adipose tissue. It was covered by a thin, smooth, but resisting membrane, beneath which were bloodvessels. On one side was a network of veins, and there were also some fibrous bands indicating where it had been attached to the fœtus. The tumour weighed a little over eleven pounds.

In these cases, puncture and embryotomy, according to circumstances, are the measures indicated.

CHAPTER XIV.

MONSTROSITIES.

EXTRAORDINARY foetal irregularities are probably more frequently met with in the bovine species than in any other. Such anomalies have been divided into different classes by investigators. Buffon gives three: 1. Monstrosities by excess; 2. Monstrosities by defect; 3. Monstrosities by irregularity in structure or situation of parts. Martin-Saint-Ange enumerates five: 1. Monsters by excess, comprising the union of several fetuses; 2. Monsters by excess of growth; 3. Monsters by absence of one or more parts; 4. Monsters by general defect, as dwarfs; 5. Hermaphrodites. For a complete exposition of classification and order, I refer my readers to Fleming's "Veterinary Obstetrics."

Those principally seen in the cow are as follows:

1. *Anidiants*.—Usually known as moles (see p. 338), comprised of skin, bones, muscles, vessels, and occasionally organs of sense—the result of a blighted embryo.

2. *Celosomians*.—Abdominal walls more or less absent, contents exposed, and frequently backward curvature of the spine. (Fig. 96.)

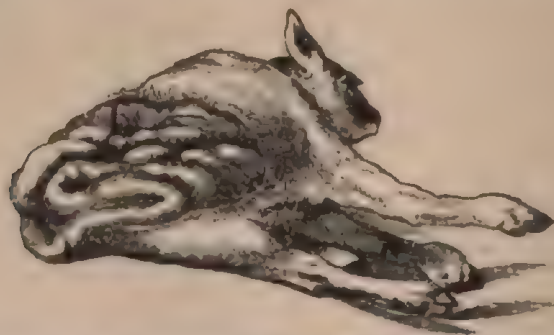


Fig. 96.—Celosomian Monstrosity (*Saint-Hilaire*); *Schistocormus Fissiventralis* (*Gurlt*): Calf.

Various anomalies exist in celosomians—sometimes the thorax is open and its contents eviscerated, particularly the heart (*Ectopia cordis*). (See p. 85.)

3. *Schistocephalus Fissilabrus* (Hare-lip).—The cleft may be confined to the upper lip and nose, extend to the whole face, or the palate may be also separated. (Fig. 97.)



Fig. 97.—*Schistocephalus Fissilabrus* or *Labium Leporinum* (Hare-Lip).
—Rueff-Baumeister.

4. *Camylorrhacchides Contorta*.—Spinal contortion the result of muscular contraction or malposition during intro-uterine existence. (Fig. 98.)



Fig. 98.—*Camylorrhacchides Contorta*.—Rueff-Baumeister.

5. *Eusomphalian and Monomphalian*.—Two heads and four pairs of limbs; in the former each has a distinct umbilical cord, while in the latter there is but one umbilical cord and umbilicus. (Fig. 99.)



Fig. 99.—Monomphalian Monstrosity : Cephalo-cormodidymus.—*Gurlt.*

6. *Polymelians*.—Supernumerary-limbed. (Fig. 100.)



Fig. 100.—Polymelian Monstrosity : Emprosthomelophorus : Calf.—*Gurlt.*

These limbs, which are usually distorted and incomplete, may be attached to various parts.

"There may also be present, in addition to the supernumerary members, an unformed kind of tumour resting on the back or shoulders, which in one case has been recognized to be composed of the heart and lungs of a second fetus. (Fig. 101.) In other instances, the tumour is alone observed, without the additional limbs."*—*Fleming*.



Fig. 101.—Double Parasitic Monstrosity: Polymelian Notomelus: Cow.—*Zundel*.

* "It is not improbable that the 'Nadeah' bullock of India is an animal with a parasitic monstrosity attached to it. A bull of this kind has been described, by an amateur, as having 'an excrescence of skin, covered with white hair, hanging from the top of the hump, about seven inches long, and of a soft nature, in appearance resembling a child's stocking, dangling from side to side as the animal moved, but in no way unsightly or repulsive to look at.'

"Such animals are worshipped, and not put to any work; they are usually exhibited covered with a kind of earth-coloured cloth, trimmed with cowrie-shells, and the owners derive a livelihood by exhibiting them. The 'fakeers,' or holy mendicants, usually obtain possession of them. These double, or polymelian, monstrosities receive their sacred designation from the god Mahadeo, who is believed by the Hindoos to have ridden upon a bull called 'Nadeah,' which was capable of changing its shape, and producing as many legs or horns for offensive or defensive purposes as it might find necessary. Thus it happens that any animal with unnatural or extraordinary marks, is supposed to have some affinity to the great 'Nadeah' of Mahadeo, the founder of Hindoo teratology."

7. *Dicephaliens*.—Double-headed or Monosomian monstrosity. (Fig. 102.)



Fig. 102.—Monosomian Monstrosity : *Dicephalus Bi-Atlanticus* : Calf.—*Gurlt.*

8. *Sysomian*.—Two distinct heads. One being usually in advance of the other. (Fig. 103.)



Fig. 103.—Sysomian Monstrosity : *Dicephalus Bicolliis*.—*Gurlt.*

9. *Hermaphrodites*.—Confusion of sex.

CHAPTER XV.

DISEASES AND ABNORMALITIES OF THE YOUNG ANIMAL.

Asphyxia.—*Umbilical Haemorrhage.*—*Persistence of the Urachus.*—*Umbilical Hernia.*—*Edema of the Umbilicus.*—*Inflammation of the Umbilical Cord.*—*Arthritis.*—*Indigestion.*—*Gastritis.*—*Diarrhoea.*—*Retention of Meconium.*—*Imperforation of the Anus.*—*Imperforation of the Vulva and Vagina.*—*Imperforation of the Prepuce.*—*Cyanosis.*—*Tongue-tie.*

ASPHYXIA.

ASPHYXIA, or suffocation, not unfrequently happens to the new-born animal for want of attention.

Causes.—Confinement in the foetal membranes, mucous accumulation in the mouth and nostrils, strangulation, syncope.

Treatment.—This consists in the immediate removal of the cause. If due to the investment of the foetal membranes, the young animal should be freed from these as quickly as possible, and the same measures resorted to when the mouth and nostrils are clogged with mucus. Strangulation may result from portions of the foetal membranes, or the umbilical cord, getting round the neck. In such a case, their release is at once indicated. The creature should be without delay put within reach of the mother, so that she may lick it, and by the warmth and friction of her tongue promote the circulation. If necessary, artificial respiration may be adopted.

"It sometimes happens that the young creature is in a state of syncope when born, or very soon after, and giving no signs of life; and observers have distinguished syncope from weakness, in which the animal is cold and does not breathe, the mucous membranes being pale and the body flaccid; and syncope from plethora or cyanosis, when the mucous membranes are of a livid blue tint, the lips and tongue swollen, and the eyes injected.

"In the first form, resuscitation is to be attempted by pouring

cold water on the head, beating the body with a cloth dipped in cold water—particularly about the face and chest—dry-rubbing the limbs, titillating the nostrils with a feather, puffing tobacco-smoke into them, imitating the respiratory movements as in a case of asphyxia, and inflating the lungs by means of a pair of bellows, acting through the nostrils. So long as the heart pulsates there is a probability of restoration to life.

“In the second form, allowing a little blood to flow from the umbilical cord, and even cutting this, or fomenting it with hot water to induce hæmorrhage, is very useful, in conjunction with cold water to the head and cold water enemas.”—*Fleming*.

Stimulating the surface of the body with spirits—as neat brandy—is often of great service. By this measure, and placing the lower two-thirds of the body in hot water, I have restored suspended animation in the human infant.

The object in view when endeavouring to promote animation, or restore suspended life, is *nervous excitability*.

“May we not suppose,” observes Dr. Ramsbotham, “that the stimulus of the atmospheric air applied to the extremities of the cutaneous nerves is the efficient cause? We have a good opportunity of observing the stimulating effects of the atmosphere (and we presume it is indebted for that stimulating quality mainly to the oxygen that it contains) on irritable ulcers. Whenever we remove the dressings from such a sore, unless it be thickly coated with pus, the patient will be sensible of a sharp pain, in consequence of the air coming into direct contact with the denuded surface. The same stimulus, in a mitigated degree, acts on the highly sensitive skin of the newly-born fœtus, hitherto unaccustomed to it.

“Dissection teaches us that the cutaneous nerves communicate most freely with each other, and that one part of the skin is supplied from the same source as the diaphragm, the chief power employed in respiration. The *phrenic*, or *internal respiratory nerve*, is derived from the second, third, and fourth cervical; and large branches from both the second and third supply the back part of the head, jaw, neck, shoulder, arm, and the upper parts of the back and chest. (Swan, ‘On the Nerves,’ p. 62.) Thus, then, the diaphragm and coverings of the upper portion of the body—parts remote in situation—are connected by the direct sympathy

of nervous communication ; and it would be an inevitable consequence, that any stimulation applied to the extremities of one set of branches, supplying the skin, would be propagated to those other extremities of the same nerve which ramify upon the diaphragm. The consequence of that stimulation would be the contraction of that muscle ; by that contraction, its convexity towards the thorax would be destroyed ; it would be drawn into the form of an inclined plane ; the capacity of the chest would be increased ; and the external air would rush through the trachea into the pulmonary cells, to fill the void thus created."

Following Sir Charles Bell's arguments, he observes : "How easy and natural, then, does not the explanation seem ! The cuticular nerves at the upper part of the trunk receive the stimulus, transmit it to the respiratory branches lying just below them ; these carry the influence impressed upon them directly to the central column of the *medulla oblongata*, where the *phrenic* takes its origin ; and thus the diaphragm is incited to its first contraction, as are also the external muscles of the chest. As soon as the air is admitted into the lungs, the extremities of the *par vagum*—which has no cutaneous branches—take fire, as it were, on the application of the hitherto untasted stimulus, and—obedient to the laws that govern the minutest fibre in the animal economy—watch unremittingly over the organ that Nature has entrusted to their care, so long as the principle of vitality holds its sway over any portion of the animated frame.

"When we contemplate the almost infinite and very intricate ramifications of the branches of nerves which supply the neck, chest, back, and throat, we could have no difficulty in explaining the first inspiration on the principle of nervous impression, carried out by *common reflex action only*, as Carpenter (par. 375) imagines. Yet the establishment of respiration is of such essential and *paramount* importance to the newly-born animal, that it seems as though Nature would not be content with any *indirect* and *circuitous* method of producing the effect she aims at ; but has obviated the chance of any misadventure occurring, by having instituted a *direct connection* at their roots between the nerves that are acted on by the stimulus of the external atmosphere, and those that furnish sensibility and motion to the great organ of breathing situated deeply within the body : for, after all, it is the

first descent of the *diaphragm* which sets a light to the train, and which originates those actions that are to continue in fervid operation until the grasp of Death paralyzes at once both nervous susceptibility and the last struggle of muscular contraction."

"The sudden sob occasioned by dashing cold water over the neck and chest of a girl under an hysterical faint, is an evidence of the close sympathy that exists between the cutaneous nerves ramifying over this part of the person, and those supplying the diaphragm; and on plunging into a cold bath, it is clearly the shock received on the upper part of the body that occasions the violent spasmodic action in that muscle. The converse of this proposition also holds equally good; for the sardonic grin exhibited on the countenance of a person whose diaphragm is wounded, proves that the *respiratory nerves of the skin* are as obedient to irritation excited on the extremities of the *phrenic nerve*, as the *phrenic* itself is to a stimulus applied to the *cuticular branches*.

"All these facts plainly indicate to us that any stimulation we may think it necessary to use, for the purpose of calling back to life an infant expelled into the world with animation suspended, should be employed upon the *upper part* of its frame."

UMBILICAL HÆMORRHAGE.

Hæmorrhage from the umbilicus is not a frequent accident in the bovine species. Nevertheless, we occasionally meet with such cases, and sometimes of an urgent character. They usually result immediately after birth, or within a few days.

Causes.—Violent traction in delivery, excessive licking or tearing of the part by the mother or young, varix, inflammation, and suppuration of the cord, after its rupture.

Treatment.—When there is but a slight oozing of blood, the outlet may be simply touched with a little tincture of iron or powdered alum two or three times a day; but, as a rule, even these measures are unnecessary.

When signs of inflammatory action or superficial ulceration are manifested, the part should be cleansed with carbolized warm water, and the oxide of zinc ointment applied once or twice daily.

In severe cases of hæmorrhage, especially when the cord is short, styptics, as tannic acid, perchloride of iron, sulphate of zinc, or nitrate of silver, should be employed, together with compression, first placing a pledget of tow or cotton-wool, saturated with the chemical, in opposition to the umbilicus, and maintaining it there by a bandage taken round the body. If the cord, however, be sufficiently long, a ligature is the safest measure.

In extreme cases, the transfusion of blood has been recommended.

PERSISTENCE OF THE URACHUS.

Persistence of the urachus, or a pervious condition of the atlantoid canal or passage, which in foetal life communicates with the bladder, is sometimes seen in calves. This condition arises from the imperfect organization of the lymph, which plugs the passage after birth. In consequence of this state, the canal, instead of becoming obliterated, remains pervious, and allows the escape of urine from the navel. It has been observed to be more frequent and dangerous in the male than the female.

Treatment.—Occasionally the escape of urine ceases with development. Surgical measures consist in ligaturing the umbilicus, or the application of the actual cautery, caustic, or powerful astringents.

UMBILICAL HERNIA.

Umbilical or navel hernia is very commonly met with in all young animals, though perhaps not so frequently in the calf as in the foal and puppy, the latter especially. Umbilical hernia is usually congenital, though it may occur some time after birth.

The hernia varies in extent, dependent upon the abdominal fissure and the amount of viscera protruded.

Causes.—Malformation, perverted growth during uterine existence, violent traction on the umbilical cord, or other injuries in parturition; non-contraction and cicatrization of the umbilical opening, violent exertion, emotion, constipation, diarrhœa, colic. Conditions favourable to a relaxed state of the tissues, as in low, wet, and marshy pastures, has been affirmed a predisposing cause.

Symptoms.—A round, soft, fluctuating tumour immediately over the navel, alternating in size according to the repletion or otherwise of the digestive organs, and the attitude of the animal. The standing position of four-footed creatures naturally favours the protrusion, whilst the pressure in a *side* recumbent position forces it more prominently forward. Coughing also distends the enlargement. The extent of the abdominal fissure can be ascertained on emptying the sac by pressure, which is best accomplished by placing the animal on its back, and when it has fasted, so that there may be no pressure of ingesta. At times the faecal contents of the intestine render the hernia hard and unreturnable, and especially where abstinence from food has not been adopted.

Results.—Inflammation (rare), strangulation of intestine.



Fig. 104.—Truss applied for Umbilical Hernia.—*Armatage*.

Treatment.—Pad with bandage, or truss, as represented in Fig. 104; constriction by the application of wood clams, ligature, or suture. (See "Accidents and Operations.")

ŒDEMA OF THE UMBILICUS.

Œdema, or swelling of the umbilical region, may result from bruising during birth, or from injury caused by the mother or young one. The infiltrations may be of serum or blood.

The swelling is distinguished from other enlargements by its coldness. Its persistence has been observed by Zundel to constitute a grave defect in young bulls, by mechanically preventing copulation.

Treatment.—Hot fomentations, absorbent liniments and lotions,

as iodine, and spirit mixtures, or mild blisters. In chronic cases, due to the presence of a blood-clot, incision and removal of the latter has been recommended. A small seton passed through the centre, though perhaps not so expeditious, would answer the purpose equally well.

INFLAMMATION OF THE UMBILICAL CORD.

This condition, commonly known as "Navel-ill," results from unduly prolonged cicatrization of the navel, after rupture of the cord. The inflammatory action usually commences in the umbilical vein, and extends to the adjoining tissues. If prompt measures to check the same are not had recourse to, suppuration becomes established, followed often by serious hæmorrhage. The same causes giving rise to puerperal infection, have also been known to produce umbilical inflammation, as likewise the entrance of air into the vein.

Symptoms.—Enlargement at the umbilical region, with heat, pain, and tenseness. Subsequently a thin, unhealthy, purulent discharge issues from the swelling. (The surface is usually moist from the commencement.) More or less constitutional disturbance is indicated, by disinclination to suck, arched back, a tucked-up appearance, hurried respiration, and variable condition of bowels. When blood-infection takes place, there is staggering, injected and yellow condition of the eyes, imperceptible pulse, and a rapid dwindling away. Before death, cedematous swellings appear on the body, whilst the abdominal veins are corded and painful to the touch. The lymphatic glands are also enlarged, and abscesses form in the muscles and other parts.

Treatment.—Frequent warm water fomentations, impregnated with carbolic acid. The application of oxide of zinc ointment, or, in more advanced cases, weak solutions of nitrate of silver, permanganate of potass or borate of soda. Local scarifications, the evacuation of collected pus. Sulphate of copper or nitrate of silver to indolent ulcers. In septic infection carbolic or salicylic acid, sulphite of soda, carbonate of ammonia, chlorate of potass, sulphate of iron, and bark. Constipation should be relieved by castor-oil and enemas. Maternal attention must be observed, a nourishing diet allowed, and occasionally nitrated water. Disinfection and cleanliness are most essential.

ARTHRITIS.

Arthritis, or "joint-disease," is a very frequent disease in calves and lambs, and unfortunately, has been more prevalent during late years. Two forms of the disease are recognized—the one being of a rheumatic, the other of a scrofulous character. Walley considers it a specific inflammatory affection of the synovial membranes of the joints—"specific synovitis."

Causes.—Exposure to cold and damp, neglected hygiene, influence of food, and, according to Bollinger, from alterations in the circulatory apparatus, viz. inflammation of the umbilicus and umbilical vessels. He found that in calves—which have a *ductus venosus arantii*, and foals have not—the direct opening of the vessels into the posterior vena cava, as well as the general implication of the latter, causes a proportionately larger number of cases in them than in foals.

Roloff considers the development of the disease is due to insufficient injection of calcareous salts, and the regime of the dam during gestation.

Symptoms.—Pain and difficulty in moving; hot and œdematous swelling around the joints, particularly the hocks, knees, and stifles; a general febrile condition of the system, indicated by injected mucous membranes; a quick irritable pulse, hurried breathing, irregular bowels, refusal to suck, intense thirst, and occasionally, but more particularly in lambs, a purulent nasal discharge.

As the disease progresses, the febrile symptoms become intensified, the swellings more prominent, irregular, and softer; finally they are denuded of hair, a yellowish-coloured fluid exudes from the skin, and as the latter is absorbed by the pressure of the effusion, it ulcerates and bursts, discharging pus, synovia and serum, more or less sanguineous, followed by sinous ulcers and extensive sloughing, involving the ligaments and articulations. Abscesses may also follow in other parts of the body, notably under the jaw and round the navel.

Death usually occurs from absorption of pus into the blood—pyæmia—which "is indicated by elevation of the temperature, fetor of the breath, diarrhœa, dark yellowish-red colour of the mucous membrane, gnashing of the teeth, rigors, and hectic fever—the latter being present also in ulceration of the joints."—Walley.

Treatment.—Warmth, counter-irritation to the affected joints, evacuation of pus. Medicinally—tonics, absorbents, alkalies, and antiseptics. To subdue pain—opiates, subcutaneous injection of morphia, chlorodyne. In sloughing—the application of astringents and caustics, and dusting with charcoal. Diet—especially nourishing, and, twice or thrice daily, cod-liver oil.

Fleming recommends the salicylate of soda, and further suggests the administration of carbolic and boracic acids and sulphate of soda in those cases in which the joint disease is suspected to be due to septikæmia as the result of omphalitis.

Professor Walley, in an interesting paper on joint-ill in lambs, *Veterinary Journal*, June, 1876, prescribes the following treatment, which is equally adapted to calves: "At the onset remove from the dam, give milk from healthy animals, beaten-up raw eggs, and good nitrogenized gruels; place in dry, warm houses, and give gentle aperients, as castor oil, or, better, a small dose of mercury with chalk; follow up by febrifuges and diuretics, as nitrate of potash and camphor, with nitric ether, or carbonate of ammonia; if much pain is evinced, give small doses of opiates—Dover's powder being the best agent of this class—or inject a small quantity of the solution of morphia underneath the skin of the joints. In the course of a few days tonic treatment should be adopted, as the administration of iron, alternated with iodide of potassium, or mineral acids with cinchona, or other vegetable tonics; and allow a little wine, good old ale, or porter.

"*Locally.*—Apply a strong blister, as the compound iodine ointment, all round the joint, at the outset of the disease; and when the subsequent inflammation has subsided, keep the joints at rest and in their proper position by the use of light splints and bandages, leaving the joint exposed for further observation. As soon as any tendency to pointing is evinced, open the joint freely, evacuate its contents, and wash out the interior with a solution of carbolic acid in glycerine and warm water—one part of the first, two of the second, and forty or fifty of the last; afterwards apply pads of soft lint or linen and tow saturated in carbolic oil (one part to eight or ten), leaving an aperture inferiorly for the escape of discharge, and changing them every day. If granulations project above the skin, apply mild caustics or astringent lotions. If the ends of the bones are carious, scrape and apply nitric or muriatic acid; if sinuses

are formed, obliterate by the use of setons, or laying them open with the knife, treating them after as ordinary wounds.

"In treating the results of this disease, it must be borne in mind that in young animals the reparative processes go on very rapidly; and that what appears to be a very formidable wound is soon converted into a comparatively simple one. Animals, too, may, with a little trouble, be fattened, and their flesh utilized; few can be preserved for breeding purposes."

INDIGESTION.

Indigestion is a very common affection in calves, and results from much the same influences which produce it in the human infant.

Causes.—Repletion, too rich—or the reverse, impoverished—milk, an excessive meal after fasting, artificial food, infected milk from bad food or impure water, acidity.

Symptoms.—Eructation, dejection, loss of appetite, yawning, nausea, staring coat, tympany, alternate constipation and diarrhoea, acid breath, furred tongue, curdy vomit, with more or less fever and emaciation.

Treatment.—In this we must be guided according to the causes in operation. Over-repletion is to be avoided. Maternal attention if the milk is in fault. Abstinence should be prevented; indeed, it may be well here to observe that the unnatural system of only allowing the calf to suck at long intervals is alike prejudicial to the parent and offspring; great mental excitement in addition to pain is caused in the former, rendering the milk more or less hurtful, while, as already observed, the fasting is injurious to the young animal. If artificial food is the suspected cause, a natural diet is indicated, while, in the case of infected milk, its withdrawal is imperative. Acidity is best treated by small doses of carbonate of soda, and the administration of the same to the mother. Constipation should be overcome by castor oil and enemas, or, if the calf be weakly, olive oil or glycerine. Occasionally vegetable bitters may be given with advantage, to impart tone to the viscous system generally; and the administration of a spoonful of very finely-powdered vegetable charcoal, given twice a day, mixed with

water in which an egg has been beaten up, has proved beneficial. In the advent of pain a dessert-spoonful of gin with 10 to 12 drops of essence of peppermint, or from 20 to 30 drops of chlorodyne in a table-spoonful of water, will be found exceedingly useful.

GASTRITIS.

Inflammation of the mucous membrane of the stomach is not a frequent affection in calves.

Causes.—These are usually acute and prolonged indigestion, acrid and irritating food, the administration of stimulating, irritating, and poisonous drugs.

Symptoms.—Vomiting, especially after food, tympany and swelling of the abdomen, with heat and tenderness over the epigastric region; furred tongue, panting, colicky pains, a dry, hot skin, and hurried pulse.

Treatment.—Cold milk, blended with barley-water or isinglass; hot fomentations, or linseed and mustard poultices to the epigastrium. Medicinally—calomel and opium, 5 grains of the former and 10 of the latter, every three hours; small doses of alkalies, and, if constipation is present, warm enemias.

DIARRHŒA.

Young calves are peculiarly susceptible to diarrhœa (white scour); indeed, probably, as in human infancy, it may be said to be their most frequent malady. "To account for this, we have only to remember the rapid development of the alimentary canal which takes place during these months, the active evolution of the salivary and intestinal glands, and the sympathy which exists between the irritation in the gums and the intestines."—*Tanner*.

Causes.—These are very manifold and difficult to classify. Probably the artificial way in which the young animals are kept influences the attack, as it is more frequently seen in those reared in buildings than when out at pasture. The various conditions of the mother's system and her milk are also influential in its production; whilst in low-lying districts, and where disregard to space and ventilation is exercised, it appears to be more prevalent.

It has also been attributed to feeding the cow on the spent grains of distilleries and breweries.

Symptoms.—Usually the diarrhoea comes on suddenly, and during the first week or ten days after birth. The evacuations are whitish in colour, and sour or foetid. The animal refuses to suck and becomes rapidly weak; there is a constant dribbling of saliva from the mouth, the eyes are sunk, and the coat dry and erect; ophthalmia has been occasionally noticed as a complication.

Treatment.—Attention should first be directed to the cause. If the mother's milk is suspected, her general health should be attended to, and the calf in the meantime suckled by another cow. Should the milk be too rich, its dilution is indicated. Acidity may be counteracted by small doses of carbonate of soda, and charcoal may also be given with benefit. In all cases attention to hygiene is necessary. Thorough cleanliness and disinfection of the dwelling should be adopted.

With regard to general medicinal agents, a small dose of castor oil, glycerine, or salad oil may advantageously be given in the first instance, to carry away any irritant matter, and this may be followed by chlorodyne, 20 to 30 drops, in a dessert-spoonful of brandy or port wine, and 1 of gum mucilage or barley-water. Should the looseness continue, mercury and chalk, or the prescription given on p. 195 may be used.

Kessel-Zeutsch, in the *Milch Zeitung* for 1877, says, with regard to the treatment of this malady: "When only isolated cases occur among the sucking calves in a herd, they are usually of a mild and tractable form, and due to cold or temporary unsuitability of the mother's milk, or to a natural predisposition to weakness of digestion. The external symptoms generally observed are the frequent passage of slimy motions, marked tenesmus, and a disinclination to suck. Consequently the calves soon become weak, and the primary consideration is, therefore, to support their strength while treating the attack. To this end it is absolutely necessary that any calf having diarrhoea to an extent requiring medicinal treatment should immediately be placed with the mother, so as to benefit by the animal heat of the cow, and by its own instinctive inclination to suck. Diarrhoea caused by over-sucking is rarely met with except when the calves have been separated from the mother shortly after birth, in which case they naturally feed too

greedily when allowed access to the teat, and so overburden their still immature digestive apparatus.

"The colour of the motion is always an index to the cause of the diarrhoea, and, with this point established, its treatment by appropriate means can be rationally conducted. When the motion is yellowish-white, the diarrhoea is chiefly dependent on simple weakness of digestion, and in such cases a couple of raw eggs, with their shells, or the whites of two eggs with some chalk, may probably be of service; or should this treatment not suffice for the cure, it may be followed by the administration of an infusion of oak bark, or peppermint root in starch. On the other hand, when the motion is of deep golden-yellow colour, slimy and tough, and the orifice of the anus irritated, the liver is at fault, and laxative and strengthening medicines are called for. These are best given in the form of rhubarb and Epsom salts, three or four times a day, in half a pint of linseed tea. Again, if the motion be slightly coloured, and have no appreciable smell, but is still accompanied by pain in the passage, the diarrhoea is dependent on the inflammatory condition of the intestines, and is best treated by decoctions of linseed, or by infusions of marsh-mallow or of chamomile flowers, either given internally, or administered as clysters. A decoction of bruised bitter almonds (125 grammes in a pint of new milk) has also proved useful in such cases. In Switzerland, and in the Tyrol, diarrhoea dependent on inflammation is generally treated by chamomile infusions, and that caused by weakness of digestion by coffee. In France the former class of cases is treated by mallow flowers, and the latter by broth made from mutton bones, or by rennet. In Holland and Oldenburgh the means chiefly relied upon are infusions of hops.

"All the above methods are good if applied early, and if the cases are sporadic only; but when the calves generally are attacked soon after birth, presenting such symptoms as diminished appetite, debility, constant passage of yellowish-white motions and fits of cramp, they are generally of little avail. In such cases the calves are but secondarily affected, and the proximate cause of mischief must be looked for in the mother cows, whose condition of blood will generally be found at fault. Till this fact is recognised, all treatment of the calves is but lost. Where diarrhoea is generally prevalent among the calves, the cow's coat will usually be found

in an unhealthy condition—the hair rough and dull, its roots colourless, and its skin covered with a crust or scale. The milk of such cows, tested with litmus paper, invariably exhibits an acid reaction. To correct this faulty condition of blood, it has been my practice to give them a lick-bit of bitter aromatics three or four times a week. The preparation employed is a mixture of equal parts of calamus root, juniper berries, and gentian in powder, to which a spoonful of salt is added. A handful of rye meal is sprinkled over it, and the powder placed in a dry state at the bottom of the crib, food being withheld for an hour or so after the dose has been taken. At the same time, to promote an increased action of the skin, the ordinary curry-combing and brushing is supplemented by a vigorous rubbing-down of the whole body, more especially of the flanks, belly and back, with wisps of straw. In a few weeks such treatment proves successful, a healthy appearance of skin and hair gradually returning, while the milk regains its normal wholesome condition, and can be taken by the calves without danger of a return of diarrhoea. Of course, careful attention is also given to the diet, all injurious substances being scrupulously avoided. Such calves as fell victims to the disease were examined after death, and in no case were any organic changes detected, but the stomach and neck of the bladder were invariably found swollen, the intestines inflamed, and the milk contained in them curdled. The *rationale* of treatment is to promote the secretion of bile, to neutralize the acidity of the mother's milk, and to support the strength. Powerful medicines are too drastic in their effects, and even if successful in checking the diarrhoea, bring on convulsions which often prove fatal. I have found the administration of small powders of opium and carbonate of magnesia, given once, twice, or thrice a day, according to the severity of the attack, extremely useful.

“To all bleeding and issues, often so strongly recommended, I am decidedly opposed, since they cannot possibly exercise any influence on organic disease, and simply serve to weaken the patients still further. As a preventive against diarrhoea, it is often recommended to place lumps of chalk in the rack for the calves to help themselves from. To this practice also I am strongly opposed. Though commonly eaten readily enough by young animals, chalk is far too irritating and constipating in its effects to be good for

them. The occasional use of bicarbonate of soda is in all respects far preferable.

"In many districts it is the practice to draw off by hand the first portion of milk found in the udder after calving, before allowing the calf access to the teat. Nature has, however, specially provided this peculiarly constituted milk for the benefit of the new-born calf, and many later ailments of digestion would undoubtedly be avoided if it were allowed this gentle natural purge. Anyone who can overcome this prejudice against its use, and let Nature have her way, will be saved endless worry and trouble in the constant physicking of young live stock."

Hertwig recommends the following as a specific remedy :

Pulv. Rad. Rhei	4·0 grammes.
„ Magnes. Carb.....	1·0 grammes.
„ Opii Pur.....	0·3 grammes.

To be given in 100 to 120 grammes of camomile tea, or in 50 grammes of whisky—the dose to be repeated in twelve hours if necessary.

Obich has great faith in the following :

Decoct. Rad. Althee Concis ...	250 grammes.
Tinct. Opii Simpl.	7·50 grammes.

Two table-spoonfuls every two hours, according to the size of the calf or the urgency of the symptoms.

RETENTION OF THE MECONIUM—CONSTIPATION.

The meconium, or excrementitious substance which is present in the large intestines of the fetus, occasionally becomes retained after birth longer than is normal, giving rise to constipation. Stall-fed animals on dry food are stated to be the most frequent producers of calves affected with this form of constipation.

Symptoms.—Frequent attempts at defaecation, with colicky pains, grated teeth, and injected mucous membranes.

Treatment.—Removal of the meconium by the finger and enemas, feeding on the first milk, and if necessary aperients of castor-oil or

rhubarb. Abundance of fluids should be allowed the parent, and it may be judicious to administer to her a saline laxative.

IMPERFORATION OF THE ANUS AND RECTUM.

Congenital malformations of the anus and rectum are not unfrequent in the bovine species, and particularly that form known as imperforation of the anus and rectum.

The former may be presented under different aspects. The following five varieties observed in the human subject, have also been noted in the calf: "(1) Simply membranous obstruction of the anus; (2) with partial or complete deficiency of the rectum; (3) communication with the neck of the bladder, or the urethra in the male; (4) communication with the vagina, in the female; (5) external communication, or fistula. The latter condition—imperforate rectum—presents two varieties: (1) membranous obstruction; (2) partial or complete deficiency of the rectum.

Symptoms.—No evacuation of feces during the first thirty-six or forty-eight hours, nausea, uneasiness, and colicky pains, with abdominal distension, refusal to suck, and repeated expulsive efforts, attended, if the anus be alone imperforate, with bulging on the fundament. "But if no bulging in the fundament be perceived after some hours have elapsed—the anus being imperforate—the lower end of the rectum will probably be deficient also. *Imperforate rectum* is distinguished by the presence of an anal cul-de-sac. The finger can sometimes be introduced into this sac to the extent of its depth, half an inch to an inch and a half. Those varieties of imperforate anus in which a communication exists with the bladder, the vagina, or externally, admit of less direct recognition during life. But the discharge of feculent fluid through the urethra, the vagina, or an external fistulous opening, will be severally diagnostic of these malformations. In the latter state, the situation of the opening varies in the two sexes. In the male, the fistulous opening may be in the perineum just behind the scrotum, in the scrotal raphé, or anterior to the scrotum. In the female, it occurs in the perineum close to the vagina, or at the posterior commissure of the vulva. In both sexes, and in all these situations—vesical, vaginal, and perineal—the vent is insufficient,

and defecation more or less difficult. Hence, constipation and intestinal dilatation ensues, especially as the feces acquire consistency, and sooner or later life becomes endangered."—*Gant*.

Treatment.—If the obstruction be simply an anal membranous one, a crucial incision through the membrane should be made; and on the escape of the meconium, which will immediately follow, a further examination should be made with the finger to ascertain if there be any other malformation. The aperture thus produced should be maintained by the insertion of an oiled suppository, or tent, which should be removed from time to time to allow the feces to be expelled; and only finally withdrawn when cicatrization has taken place. The same measures are indicated in *deficiency of the rectum*, with the addition that the bowel when opened is to be drawn outwards and attached to the edges of the external wound by catgut sutures.

"In the case of a communication with the *bladder*, the opening is situated at the neck of the bladder, or more commonly at the anterior part of the prostatic portion of the urethra; it is not usually direct, but through the medium of a narrow channel, and is always small and insufficient. But the urethral aperture appears to be usually of a valvular character, so that, although feces can pass into the urinary canal, the urine is unable to enter the rectum. The same operation should be performed as in the condition of imperforate anus, coupled with deficiency of the rectum. Amussat, in 1835, first proposed that the end of the bowel should be brought down and secured to the integumental wound at the site of the anus; a proceeding much advocated by Dieffenbach. A passage with mucous membrane is thus made for the escape of the feces, and the liability of feculent extravasation averted, and its consequences, diffuse cellulitis and peritonitis. Colotomy must be had recourse to when the bowel is seated at a depth beyond an inch and a half to two inches."

"Rectal communication with the *vagina*, or a fistulous opening in the *perineum*, may be remedied by either of two operative procedures—enlargement of the original outlet, or the formation of a new anus at the natural site, and closure of the abnormal anus.

"Recto-vaginal communication has been cured in both ways. To establish a new passage at the natural site, a curved director, or sound, should be passed through the vaginal opening into the

bowel, with its point directed to the site of the anus; this is then cut open in the middle line, the incision being carried backwards (in the calf upwards) towards the coccyx. A free opening having thus been made in the bowel, it is brought down and secured by sutures to the margin of the integumental wound. Dilatation must subsequently be maintained. Closure of the abnormal communication with the vagina may take place spontaneously. Generally, it will be necessary to assist contraction and closure by touching the edges with the actual cantery; or, if the opening be large, the edges must be pared and brought together by sutures. After either procedure, the bowels should be kept at rest by opiates for several days, until closure has taken place."—*Gant*.

"In those female animals in which the rectum communicates with the vagina, Rainard makes the following remarks with regard to the operation. As the part of the vagina which has the opening into the rectum is never very deep, a half S-curved sound is introduced by one of its ends into the normal track, and pushed into the rectum until it reaches the *cul-de-sac* in it. With a bistoury an incision is then made where the anus should be; the skin and subcutaneous connective tissue being divided, the index finger is passed into the wound in search of the curved sound in the rectum. When met with, an assistant takes the sound, while the blade of the bistoury is made to glide over the nail of the index-finger, and the intestine opened by it. The same finger is plunged into this new opening, and serves to guide the bistoury in dilating the incision as much as may be deemed necessary. After the skin and connective tissue is incised, a trochar of sufficient size may be employed to puncture the intestine.

"Landel (*Journal Vétérinaire Belge*, vol. i. p. 95) met with a case of this kind in a cow, aged one and a half years. On examining the creature, he found that the anus was occluded, and that the vagina contained fluid faeces which had passed into it by a narrow opening leading to a canal communicating with the rectum. Landel decided to make an artificial anus. He made an incision in the perineum about two and a half inches in length, through which the faeces escaped. On the following days enemics were administered; the margin of the wound tumefied slightly; the recto-vaginal fistula became obliterated, and the young animal made a perfect recovery."—*Fleming*.

M. Mathieu, V.S., Aney-le-Franc (Yonne), (*Veterinarian*, 1852), records the following cases of congenital malformation of the rectum:

"(1.) *Opening of the Rectum into the Vagina.*—This was a female calf (only four days old), about to be sent to the butcher's. The parents had no malformations. But this calf had neither tail nor proper anus; the anal opening being within the vagina, at about four-fifths of an inch from the superior commissure of the vulva. When no fæces are passing this aperture is closed; possessing as it does the power of contractility, as may be perceived by the introduction of the finger. Its *autopsy*—after slaughter—presented some remarkable peculiarities. The sacrum was not above half its usual length; not extending more than a third over the pelvic cavity, and being, in fact, hardly recognizable as the same bone. The coccygeal bones are wanting, or at most are represented only by a light irregular bone no larger than a nut. The rectum is in its ordinary position, and altogether normal, having its termination, where it perforates in an oblique direction, in the vagina, at nearly an inch in front of the superior commissure of the vulva.

"(2.) *Opening of the Rectum into the Bladder.*—On the 29th of August, 1850, M. Vachez, farmer at Aney-le-Franc, begged me to look at a young calf, calved on the 26th of the same month. A neighbour told me that my employer had suggested and made an incision through the skin, in the situation where the rectum by nature ought to have terminated. The animal appeared quite healthy and of ordinary size, and its parents were without defect. But there is no anus to be seen, the skin being continuous in the place where it should be, and covered with hair. A vertical incision has been made with a razor, with the intention of penetrating into the rectum. The animal keeps making continually violent efforts to expel the contents of the rectum, but to no purpose. I introduced my finger into the artificial aperture that had been made, but could feel no traces of rectum. I, with a bistoury, penetrated deeper into the pelvis, but in vain. At last, in the act of placing the animal on its back, with a view of continuing my exploration, my right hand came suddenly in contact with meconium; and I soon discovered that there was a quantity of it in a liquid state in the vicinity of the extremity of the sheath where the long hair grows. This discovery rendered the diagnostic evident. *The rectum opens either into the bladder or the urethra*; though the latter supposition was rendered hardly tenable by the circumstance of the intestines now being discoverable through the former incision. I recommended Vachez to suckle the calf, and so prepare it for the butcher, in the hope that if fæcal matters continued to be expelled along with the urine, life might be prolonged sufficiently to give it time to fatten into veal for the market. On the 3rd of September I received notice that the calf was killed; since for four days it had taken nothing, and had suffered considerably. I went immediately, but still arrived almost too late, the butcher having already rendered all but impossible any methodic autopsy. The carcase was lean, and presented the following peculiarities:

"There was but one kidney, and that conglomerate, and on the right side; but it was very bulky, and equal in weight to two kidneys of an animal of the same age and magnitude. The artery and vein supplying it were double their natural volume; and the ureter, much larger than ordinary, was single,

and opened, after a course of six inches, into the centre of the upper surface of the bladder : the bladder itself, though in other respects normal, being at this part prolonged from before backwards, the same as it is found to be in the young animal. Its contents were a mixture of urine and meconium. The superior side had two apertures along its medium line ; the ureter occupying the centre, and immediately behind that, the posterior orifice of the rectum. The urethra was normal.

"The rectum was enormously distended with accumulated fecal matters ; and, from having become larger than common, had suddenly contracted its volume, making a curvature to the upper part of the bladder, whereupon it terminated, being contracted at its opening to one-seventh or one-eighth of its original calibre. Its peritoneal coat was continuous with that of the bladder ; its muscular fibres likewise spread in all directions upon, and became interlaced with, those of the bladder ; while the mucous coats of gut and bladder had become continuous and confounded. The circumstances of the termination of the rectum being in a manner *strangled* from contraction, and barely sufficient to allow the passage of the feces, accounted for the extreme state of distension in which the gut was found, as well as for the efforts made by the animal during life.

"In the two cases just related, the absence of anus was accompanied with remarkable anomalies in the posterior part of the spine, and in the urinary organs ; a circumstance suggesting the belief that in such cases it is not the absence of anus alone that we have to deal with or to consider. And that in such cases, it appears more prudent to prolong the life of the animal until it shall be in a condition fit for the butcher.

"In regard to congenital contraction of the anus, attended with symptoms of continual efforts to void matters which come away from the animal in thread-like particles, the affection may be treated with success by the use of tents, used so as to serve the purpose of dilators."

IMPERFORATION OF THE VULVA AND VAGINA.

Imperforation of the vulva from adhesion of the labia is very occasionally met with in new-born calves. Attention is usually directed to this condition by the repeated and fruitless efforts of the young creature to urinate. Unless speedy relief is afforded the urine escapes through the navel, or should this outlet be stopped, death speedily ensues from distension and rupture of the bladder.

Treatment.—This consists in forcible separation of the labia, and smearing the detached surfaces with the oxide of zinc ointment until healed.

Imperforate vagina indicates similar treatment, with, for a time, the frequent introduction of a dilator.

IMPERFORATION OF THE PREPUCE.

This condition, not unfrequently seen in the dog, is of extremely rare occurrence in the calf. In such a case an artificial opening is to be made at the seat of occlusion, and the lips of the wound kept apart until the edges are healed.

CYANOSIS.

This peculiar disease is due to malformation of the heart, or permanence of the foramen ovale; the arterial and venous blood becoming mixed, a peculiar blue or violet colour of the visible mucous membranes exists, giving rise to the term *blue disease*. The affection has already been considered in the chapter on 'Diseases of the Heart.'

TONGUE-TIE.

This congenital malformation is not unfrequent in calves. "Tyvaert" (*Annales de Méd. Vétérinaire*, June, 1877) "has observed this condition on six occasions in calves. It is similar to tongue-tie in children and certain birds, and is characterized by the frænum linguæ being too narrow from above to below, and too much prolonged forward—sometimes extending to the root of the incisor teeth. This anomaly greatly hinders the prehension of food and swallowing of fluids; the calf, if drinking out of a bucket, vainly plunges its face into the fluid as far as the eyes. The teat is seized with difficulty, and the tongue is so limited in its movements that it cannot be protruded to lick the nostrils, as is the custom with bovine and some other creatures. The defect is often unperceived, and the young creature loses condition, becomes weak, and eventually succumbs.

"The treatment is very simple. It consists merely in dividing the frænum to such an extent that the tongue may recover its liberty of movement. Immediately after the operation, the creature protrudes its tongue to lick the blood which escapes, and it can drink with ease. The wound heals in a few days without any precautions."—*Fleming's "Veterinary Obstetrics."*

CHAPTER XVI.

DISEASES IMMEDIATELY CONNECTED WITH PARTURITION.

Parturient Fever.—Parturient Apoplexy.—Puerperal Mania.—Agalactia.

PARTURIENT FEVER.

PARTURIENT fever, or parturient septikæmia, is a disease which has been, and still is, frequently confounded with parturient apoplexy, commonly termed 'milk fever.'

Little appears to have been known, or at all events written, concerning parturient fever until recently. Large numbers of ewes have been lost year after year in the lambing season, particularly in that of 1881, from this fatal disease. Cows have been seized with the same malady, among which it has been this year especially prevalent.

Parturient fever is due to the introduction of putrid or septic matters into the blood during the parturient or puerperal state, hence the term "Parturient Septikæmia." Contrary to parturient apoplexy, it is exceedingly infectious, and varies in its attack from the day of parturition to eight or ten days afterwards.

Causes.—Injuries and disease of the genital organs are the chief causes of parturient fever; hence it follows upon abrasions or wounds of the mucous membrane, inversion of the uterus, retention of the placenta, or a dead fœtus, and is complicated with metritis and metro-peritonitis—the latter always occurring in parturient fever. Exposure to wet, cold, draughts, and foul atmosphere are also productive causes. It has also been considered dependent on a metastasis, not of the milk, but of the blood destined to form that secretion, from the mammary gland to the peritoneum. Plethoric animals are more especially predisposed to the disease.

Post-mortem Appearances.—Decomposition commences rapidly

after death. The abdomen is usually enormously distended, and on cutting into it a quantity of fœtid gas escapes. The lining membrane of the cavity is intensely red, and contains sanguinolent and turbid serum mingled with flakes of lymph. The tissues generally are of a dark-greenish hue and offensive. The uterus is usually abnormally large, and contains a quantity of reddish-brown or chocolate-coloured fluid emitting a repulsive odour. The walls of the organ are thickened, softened, and infiltrated with blood-stained serum and pus. Ecchymosis is found on several parts of the mucous membrane, the latter being more or less livid or dark green. In several cases I have been this year called upon to inspect, an almost universal greenness approaching black was present, while the cotyledons resembled rotten sponge, and were semi-detached. Extravasations of blood are visible on most of the serous membranes and in the muscular tissues. Thrombosis of the uterine veins has also been observed, and the same condition has been found in the lymphatics.

Symptoms.—An increase of temperature is usually the first indication of the malady. Immediately upon this rise the pulse becomes accelerated, the respiration hurried, rumination ceases, the lacteal secretion is diminished, the mucous membranes injected, and the horns and ears are hot. As the disease becomes more firmly established the general febrile disturbance increases. The temperature rises to 105° or 107°. The pulse is hard and small, sometimes exceeding 100 per minute; the respiration short and catching. Pain is manifested by the animal whisking the tail, stamping, striking the belly, frequently lying down and getting up, and grating the teeth. The abdomen is large and drum-like, and sooner or later serous effusion takes place, which may be diagnosed by hand-manipulation and percussion. As in parturient apoplexy the cow maintains a recumbent position; but unlike the former, this is due to prostration and not paralysis.

“A very marked symptom is the tumefaction of the vulva—the labia of which are separated—and the discharge therefrom of a fluid, at first serous, and either transparent or having a yellow, chocolate, or reddish tinge; then it becomes gradually thicker and more abundant, and becomes modified according to the termination of the disease. Manual exploration of the vagina discovers it to be very hot and sensitive, particularly towards the cervix uteri; and

when its lining membrane is exposed it is observed to be swollen and reddened, and sometimes there are found diphtheritic ulcers and croupous deposits on the inflamed surface. In some cases, when the uterus is very much swollen, and particularly in lean, flat-sided animals, the inflamed organ can be felt on the right side, and pressure on the abdomen often, but not invariably, causes pain. Rectal exploration generally discovers the uterus larger than natural, and more or less distended by gas."—*Fleming*.

The animal usually dies comatose or in convulsions.

Treatment.—This may be summed up as follows: complete isolation, disinfection, antiseptic measures, counter-irritants, stimulants; and during convalescence, tonics and nutritive food.

After the removal of any infective matters from the uterus or vagina, and disinfection of any wounds or abrasions in these parts, *Fleming* observes: "The genital canal should be thoroughly cleansed by injections of warm water, and the wounds dressed with carbolic acid and olive-oil (1 to 10), applied by means of a brush or feather; or salicylic acid 1 part, spirits of wine 20 parts, warm water 24 parts.

"After the interior of the uterus has been cleansed by injections of warm water, an injection of carbolic acid solution (1 to 20—50) should be made every day, and the wounds, if accessible, must be dressed at the same time.

"Permanganate of potash (1 to 50 of water) may be employed to inject into the genital canal, when the disease is less acute."

In my own practice I usually prescribe as an injection carbolic acid 1 part, glycerine 10 parts, water 30 parts. With regard to constitutional treatment, powerful stimulants are of the greatest service; and in addition to these, carbolic or salicylic acid may be advantageously given.

In acute cases the intra-venous injection of carbolic acid and iodine has been employed successfully as a more active antiseptic measure. And in the human subject, as a last resource, the transfusion of blood has been practised.

In cases where the pain is great, mustard embrocation, or rugs steeped in hot water, may be applied to the abdomen, and sedatives may be administered per mouth or injected subcutaneously. If constipation exists, a *saline* aperient should be given; but under no circumstances must drastic purgatives be employed.

"Peritonitis may be combated by the exhibition of large and frequent doses of calomel. Van den Eide and Clement were successful in treating serious cases of metro-peritonitis by administering calomel, and applying mercurial ointment to the abdomen."—*Fleming.*

In the convalescent stage *mineral* tonics are indicated, particularly the salts of iron; and the food should be highly nutritive, but at the same time easy of digestion, and not over-stimulating.

Great care should be exercised in handling animals suffering from, or which have died of, parturient septikæmia, as the most dangerous results may follow inoculation.

The most cautious protective measures are therefore to be employed, the hand and arm should be first smeared with carbolized oil, and afterwards thoroughly cleansed in carbolized water.

From the infectious nature of the malady a disregard of these instructions has resulted in the loss of some thousands of ewes this year.

MILK FEVER OR PARTURIENT APOPLEXY.

Parturient apoplexy, commonly known as milk fever, or dropping after calving, and in the professional world by a host of other titles, is a disease with which most cattle owners, or at all events dairymen, are unfortunately familiar.

Concerning the pathology of parturient apoplexy much has been written by various members of the veterinary profession, and numerous scientific discussions have taken place regarding it. There are few diseases the dairy-farmer has a greater dread of, not only from its fatality and that the victims are invariably his best milk-producers, but also from the knowledge that if the animal does recover, her dairy properties are to an extent lost, as a cow rarely, if ever, yields the same abundance of milk that she would have done had she escaped the malady.

There is no disease that I am aware of which bears any analogy to this one. Even in those presenting some of the same symptoms, such as affections of the brain, paralysis, metritis, or metro-peritonitis, they are so poor a resemblance generally that no person with any experience of parturient apoplexy could easily confound them.

One of the chief symptoms being loss of power or partial paralysis of the hind-quarters, rendering the subject primarily unsteady in its balance and subsequently unable to stand, has given rise to the term "dropping after calving," and also because it is generally a sequel to that event.*

The attack usually takes place from one to three days after calving; it is an exceptional case when symptoms of parturient apoplexy present themselves after the latter date.

Cows in high condition, and, as it will be seen, which are deep milkers, are most liable to this disease. Good-bred cattle are also far more susceptible to its influence than those of a coarse or hardy breed. It may be that cows of a superior quality are kept better than those of an inferior kind, and in consequence exposed to this susceptibility; whether this be a correct supposition or not, my experience has led me to the conclusion that when high-bred cattle do become affected with parturient apoplexy they more quickly succumb to it than those of the opposite type. Class also would appear to have its influence: Alderneys, for instance, are exceedingly prone to it, and with them it is more frequently fatal. To account for this, I think I may again refer to their purity of breed and high condition, for though externally they usually look poor, a post-mortem examination invariably reveals an abundance of fat; and we may further add to this their extreme susceptibility to cold, which is one of the predisposing causes of parturient apoplexy. And these cattle are imported unprepared from their native warm climate to our changeable and cold one, and usually within a few days of their time for calving; and thus, before they can possibly become acclimatized and used to a new system of feeding and management, they bring forth their young.† From these considerations it cannot be any matter of surprise Alderneys are such marked victims.

Firstly, then, what are the predisposing causes of this disease? I have already observed that cold, breed, and condition play their part in its production; and to these may be added inattention to

* There are cases recorded, and of which I have had experience, of this paralysis taking place before parturition.

† I am, of course, only alluding to those which have arrived at the fatal period. I am aware many of the imported Alderneys are only in calf with their first or second.

the bowels; this is an important matter, for if constipation is present at the time of parturition, and is not immediately overcome, the worst results, in case the animal is attacked with parturient apoplexy, ensues, for it cannot have failed to strike everyone who has had experience in cattle practice, that constipation in the cow, especially in this disease, is but with the greatest difficulty removed, and in very many instances our patient succumbs to the disease without our medicines having taken the slightest effect, obstinate constipation remaining to the last, though drugs enough to operate on a dozen animals may have been given. Indeed, in many instances constipation is an exciting cause of parturient apoplexy.

"Reasoning analogically," says Professor Walley, "you must all have—at any rate those who have suffered from this unpleasant affection—been struck by the painful sense of fulness in the vessels of the head in endeavouring by violent efforts to expel hardened feces from the rectum; and this straining has been frequently the cause of cerebral apoplexy in the human subject. How much more injuriously, then, must it act in an animal with such large stomachs as the cow, especially if superadded to this pregnant condition? And in old animals, you must bear in mind, this is intensified, as in them all the hollow viscera become more voluminous, and there is a greater probability of organic disease existing than in younger animals."

Eating the cleansing, or after-birth, acts as a predisposing cause of this disease in two ways. Firstly, by producing that very constipation, or rather I should say, a stoppage of the bowels, which in such an instance is rarely overcome; and secondly, by inducing from its retention by, and decomposition in, the stomach an amount of low enteric fever. Another predisposing cause submitted by Professor Walley is "anatomical conformation, as in animals having short cervical vertebrae and being very round in the barrel; and in this way hereditary tendency is transmitted, the tendency becoming increased by multiplied consanguinity in the same way as seen in other affections in which the tendency is hereditarily propagated."

Age, again, is a predisposing cause. Cows are rarely attacked before their third calf. Out of the great number that have come under my own observation, I have only seen one case with the second birth. Why they should not be liable to parturient apo-

plexy before this period is probably because the vascular system is not replete, and the lacteal secretion is not so great at the first two births as at the third and fourth. I have had more cases at the birth of the third calf than at any other period, and this would almost show that cows at this age are more liable to apoplexy than later on in life, their constitution being more vigorous, and their habit of body more plethoric, than when aged.

Exciting Causes.—Amongst these may be mentioned, previous cerebral disturbance, injury to the spinal column, a prior attack of the disease, and the milk-forcing system. As soon as the cow has calved, what is more natural than that the farmer's wife, or dairy-maid, should be anxious to get as much milk as possible; and to accomplish this object, the animal, which previously had, perhaps, only been turned out in a straw-yard, is supplied with a large quantity of nutritious food; and this sudden change in the diet from poor to rich, is calculated not only to produce functional derangement of the digestive organs, but constitutional and sympathetic disturbance of the brain and nerve-centres, and, as a result, parturient apoplexy. Plethora, probably present at the time of parturition, is increased by this unwise, though well-meant, resort to produce in haste that which would answer the purpose as well after all danger had passed.

Again, another exciting cause is the unnatural practice of removing the calf as soon as born, and only allowing it to suck at long intervals—a system, independent of this disease, injurious both to mother and offspring. Very often this measure is aggravated, and becomes positively cruel, by placing the calf within sight and nearly reach of the mother, whose milk is rapidly secreted, and in excess of the accommodation provided by Nature, if the young is prevented reasonable access.

The chief acting cause of parturient apoplexy is a superabundance of blood in the body immediately after parturition, which, instead of producing, as in the course of nature it should, proper support for the offspring, is retained in the system. The vessels in consequence are considerably overcharged, the distension and congestion which result therefrom produce pressure on the brain and nerve-centres; paralysis of the parts in connection with the generative organs first takes place, succeeded by general coma, and if not relieved, death. Finlay Dun explains it in the following words:

"The large quantities of blood that have, until the time of parturition, been nourishing the calf, are not diverted into their new channels for the production of milk. If at this critical period the bowels are constipated, and the udder does not at once take on its functions, this superabundance of blood soon becomes a source of much mischief. It produces congestion, and subsequently inflammation of the brain (?)^{*} and nerve-centres; serum is poured out, causing by its pressure impairment of motion and sensation, arrestment of secretion and excretion, a sluggish, almost imperceptible pulse, and slow, stertorous breathing."

Fleming observes: "Consequent on the uterus contraction and diminution, a great portion of the circulation is diverted from it. The blood is poured into the larger trunks and into the aorta. The quicker and more continuous the uterus contractions, the more considerable is this flow of blood. Attention may be casually directed to the fact that the after-pains are much more severe and continuous after a speedy parturition, than after a tardy one. The blood forced back generally finds its normal outlet by the udder and skin; and by watching every normal parturition, one can observe the acute swelling of the udder, which swelling varies in proportion to the number and violence of the pains. By this outflow into the udder and skin, and by which a collateral fluxion is established, the accumulation of blood already alluded to, which would be followed by aortic pressure,[†] is got rid of without detriment to the animal. In cases, however, where this stoppage is sudden and violent—as happens after a chill to the surface of the body—the aortic pressure must undoubtedly be considerably increased.

"One consequence of the increased pressure—always easily observable after a little time, as will be shown presently—must, among others, be congestion of the brain. But the soft brain-tissue can only offer a slight opposition to the distension of the vessels; consequently, sudden effusion, and, as a result, brain oedema ensues. This brain oedema, on its part, causes contraction of the vessels, and, in its way, arterial anæmia. The whole process,

^{*} This is hardly borne out in post-mortems.—*J. W. H.*

[†] It must be remembered that blood stasis and undue distension of vessels is not always due to blood pressure. Altered innervation of the walls of the vessels themselves can bring this about.

which can be followed step by step, is greatly aided by (a) the heart's hyperplasia, (b) the increased flow of blood, and (c) the hydræmia which exists in pregnant animals. After parturition, the heart does not at once resume its normal size; it remains for some time in a hypertrophied state. In fact, it seems as if the heart, in good milking cows, follows the same law as increased circulation in the swollen udder, and is much more enlarged than is the case with inferior milking animals. The result of increased power of the heart is increased action. The blood, which has been largely increased in the pregnant animal, does not at once return to its normal quantity after parturition, but materially aids in producing congestion.

"The remarkable fact always, however, holds true, that animals which are in good condition without being fattened up, and those in which the circulation is healthy, are particularly susceptible to calf-fever. An animal which has calved is like one into whose circulation a certain quantity of blood has been transfused. This superabundance of blood does not quickly disappear from the body; it takes, so to say, the place of a new organ. In animals which have just brought forth, the milk secretion expends this blood." Exactly, it is just this non-expending of blood by misdirection, or non-secretion of milk, that produces parturient apoplexy. And there can be no doubt the pressure involved through the great volume of blood in the body on the nervous system, produces the paralysis always seen in these cases.

A medical man once observed to me when conversing with him on the subject, that there was no such thing as milk fever, that the disease so termed was caused by a small portion of placental membrane being conveyed through the circulation and deposited on the brain, and thereby giving rise to those symptoms of cerebral affection so prominent in this disease. This theory, however, has not been practically demonstrated, whereas the revulsion of blood is indisputable in every case, and I think the kind of cases that milk fever follow prove the latter theory to be the correct one, for it will not, I dare say, have escaped the most ordinary observant's notice, that cows which calve quickly are those which are attacked with milk fever, whilst in protracted or difficult parturition it is the reverse. And why is it so? Simply because in a quick and easy birth, the extra volume of blood is suddenly left in the

system, and is not expended with the same rapidity; whilst in a protracted one, the animal being a longer time parting with the fetus, a certain amount of hæmorrhage takes place, and this, together with her being exhausted, renders the shock and its consequences not so sudden.

Symptoms.—The earliest indications of the disease are as follows: Cessation of rumination and appetite, grating the teeth, uneasiness—the animal is constantly moving her feet, particularly the hind ones, and shuffling about, and if made to move a step or two an unsteadiness in her gait will be observed; pulse accelerated, breathing heavy and somewhat hurried, muzzle dry and hot, horns and ears increased in temperature, eyes brighter than usual, and staring; an anxious bewildered expression of countenance, udder enlarged (though not always), hot and tender; partial, and in some cases entire, suspension of milk.

As the malady progresses the cow begins to sway from side to side, inclines forwards, and from time to time crouches; the symptoms advancing, she soon commences to reel about, and then falls; half rises, and falls again, and so on, until at last she sinks down altogether, and frequently bellows at her inability to stand. It is at this period that the disease makes rapid progress, the poor animal moans, pants, and plunges about, vainly endeavouring to regain her feet. But the dread affliction has laid its hold too firmly upon her; helpless and exhausted, she ceases to struggle, her head is extended on the ground or thrown back on her side; the rumen or paunch becomes tympanitic from suspension of its functions, and eructations, constipation, and retention of urine accompany this condition. The pulse is quick, small, and wiry, becoming towards the latter stage of the disease almost imperceptible. The animal speedily falls into a state of coma, and is unconscious of all around her, even her own offspring. In some, partial consciousness recurs from time to time; in others, the coma is persistent, until recovery commences or death takes place. During this stage she may be quiet or delirious. As the disease proceeds to a fatal termination, the respiration becomes shorter, emitted as it were in puffs, the pulse weaker, the eyes fixed and glassy, often sunken deep in the orbits, and there is an involuntary flow of tears, but more frequently present before the eye sinks; the extremities and body

are cold, the limbs stiff, the tympany increased; the cheeks are inflated at each expiration, the mouth within icy cold, and drawn back at the angles, the lower jaw dropped and powerless, with often the tongue protruding at the side. Death may be approached without a struggle, or in the midst of convulsions, usually the former.

Duration.—The duration of the disease varies according to the causes and lesions which result. Sometimes death takes place in six hours from the first symptoms of illness observed; in some cases twelve hours elapse before death or convalescence takes place; whilst on the other hand I have known patients prostrate and unconscious for twenty-four hours or more, and then recover. As a rule we may take the crisis at the twelfth hour from the earliest symptom; at that period a change for better or worse may be looked for. An alternately comatose state is always unfavourable.

Post-mortem Examination.—This reveals but little. The viscera (excepting a congested state of one or both lungs, due to the lateral recumbent position, the access of foreign matters in drenching, cruetation, or other usual causes of congestion) are generally healthy, to the disappointment of the quack, and surprise of the owner. The chief seat of the disease appears to be the brain; here will not only be found congestion, but in the majority of cases actual rupture of vessels on that organ, and thereby showing the necessity of venesection, if it is to be adopted, in the early stages of the malady. The spinal cord, chiefly in its lumbar region, has occasionally been observed congested; but as a rule the nervous system exhibits no diagnostic lesions.

Treatment.—This will of course depend upon the state the patient is in when first seen amiss. I shall, however, here suppose we are commencing treatment in the primary stage of the disease. There has been considerable dispute as to the advantages derived from bleeding—some advocating it under any circumstances, others opposing it. Mr. Youatt observes, "The disease is an inflammatory one, and must be treated as such; therefore the patient should be bled." Now it does not necessarily follow that because a disease is inflammatory, blood should be drawn. Parturient apoplexy, moreover, is not an inflammatory disease; yet, granting it were, a line must be drawn as to the practice of venesection. Bleeding must

depend upon the condition of the pulse, the degree of fever, and general symptoms. A quick, small pulse, cold horns and ears, a tympanitic rumen, and semi-comatosed condition, are indications forbidding the abstraction of blood. But, as I have already supposed, we are commencing treatment in the early stage of the disease. When the animal is off its food, unsteady in gait, with an accelerated though not feeble pulse, increased temperature of horns and ears, and vacant or bewildered look, then the abstraction of blood is undoubtedly beneficial. From four to six quarts should be allowed to flow from the jugular, the opening being made with a large-bladed fleam. But I hold that it is only admissible at this period, for when the disease has so far advanced that the patient is down with the more advanced symptoms, it is entirely useless, and tends rather to hasten the case to a fatal termination than lessen the severity of the symptoms. I have in no single instance seen good results follow bleeding except in this early stage, in which unfortunately the veterinary surgeon is rarely called in. I have, however, heard professional men advocate opening both jugulars at once, even after coma has taken place. It would be as well had they included the carotids, if to hasten death, which such a procedure would assuredly do, were their object, for no amount of bleeding will remove the clot that has formed on the brain. This bleeding mania is, I am glad to say, exceptional, and owners of cattle may be thankful it is so.

In case, then, blood has been removed, the next and most important procedure is the administration of cathartic medicine and the drug selected should be one of speedy action. At one time I adopted the practice I had seen as a pupil of administering a combination of agents—viz., Epsom salts, aloes, jalap, cream of tartar, nitrate of potash, camphor, etc., all *en masse*. I now prefer, as possessing the speediest and surest action, croton oil, from 30 to 40 drops, well blended with 1 pint of linseed-oil. From its irritating and drastic properties, I need scarcely remark it is very imperative that it should be so blended. I have known of more than one instance where, given in a non-oleaginous drench, the croton oil has floated on the top, and, coming in direct contact with the mucous membranes, has produced violent gastric and intestinal inflammation ending in death; but mixed with linseed or salad oil, such a result need not be feared.

The after-treatment should be purely stimulating. In an hour after administering the purgative, a pint of brandy with an equal quantity of water should be given; and this must be followed in proportionate doses, and at stated intervals, according to the animal's condition. The beneficial effects of stimulants in parturient apoplexy are so well known to practical men that I need say but little about them. I have had many successful cases of more than twenty-four hours' duration, and in which time my patient has had two and sometimes three bottles of brandy, and when the stock of that has been exhausted, port wine. With some persons I know it is an expensive remedy, particularly in such a generally fatal disease; but my confidence in it is so great that I would not willingly undertake the treatment of a case without it. As a compulsory alternative I would prescribe $\frac{1}{2}$ to 1 ounce doses of carbonate of ammonia frequently. The aromatic spirits of ammonia in the same dose is also exceedingly useful, especially if tympany be present.

It has been argued by theoretical men and total abstainers that large and repeated doses of alcohol will in their secondary effect produce the very coma we are trying to overcome; but practice will not bear this view out, and it is a practical view of the subject we must take. I do not assert stimulants produce no after-sedative effects, but it is very different to the coma consequent on, or associated with, parturient apoplexy. It is one strong force overcoming another. An important matter in the repeated administration of stimulants (alcoholic) is to keep the bladder empty where paralysis exists and it is powerless to contract upon its contents, and this I always do by frequently drawing off the urine with a catheter.

At the onset of the disease the spine, particularly the lumbar region, should be well stimulated with ammonia and turpentine or mustard embrocation, and a fresh sheepskin placed over the part. Some persons prefer continually moving a hot warming-pan along the back; others, placing bags of hot salt on the loins, continually replacing them before becoming quite cool. I can speak to the advantage of the last measure.

The mammary gland should be gently and frequently rubbed with the hand to increase the circulation and promote the lacteal secretion, and what little milk is present must be continually drawn away at short intervals. Many persons are in the habit of milking

their cows previous to calving—a measure which, in my opinion, cannot be too strongly censured. It is, to say the least, most unnatural, encouraging the secretion before it is required, and producing a greater shock to the system by its sudden suspension, in the event of milk-fever setting in. Indeed, it is not improbable that the large quantity of milk there is at the time of parturition, owing to this practice, is one of the causes of the disease.

Regarding the position of the patient, she should be placed with her foreparts a little elevated, and what is still more essential, throughout the case the head should be kept well up. My own practice is to suspend it by means of a rope round the base of the horns (previously placing a swab or towel round) to a convenient beam; and by means of side-lines to a head-collar she may easily be prevented from dashing the head about. Concerning this matter I am most particular, for I believe in many cases a successful issue is considerably assisted by its attention, as it prevents to a considerable degree a determination of blood to an already congested brain, and the period of coma is avoided for a longer time. Indeed, I have witnessed instances of almost sudden coma where it has been necessary to let the head down for a few moments from its exalted position.

Keeping the head cool is also another important matter, either by means of a watering-can or by saturating a piece of flannel folded several thicknesses and laying it between the horns, so that a portion may lie over the front of the face, and the remainder on and behind the poll. This does not wet the bed of the patient so much as a stream of water, and if continually renewed, answers the purpose almost if not quite as well. In the winter-time I have used ice with excellent results; placing the pieces on the back of the poll, and allowing them to remain until melted. Dashing cold water in the face when the animal is drowsy or in a state of semi-coma has a reviving effect; the application of strong ammonia to the nostrils is also useful. It is necessary the patient should be turned from time to time on the opposite side to prevent cramp, facilitate the removal of milk, and encourage the action of the bowels. A position on the brisket should, if possible, be maintained.

Thus far, I have mentioned the principal treatment we are called upon to adopt, or rather that which I myself pursue. Should the

measures prescribed be insufficient, help must be sought from other sources. If, for instance, the bowels do not respond in a reasonable time to the medicine, or no expulsion of *fæces* takes place, if practicable, half the quantity of croton oil may be again administered.* Again, owing to the incapability of the rumen to discharge its contents, the ingesta within it begins to ferment, and an accumulation of *fœtid* gas takes place; the distension in such cases is often very excessive and distressing. Under these circumstances I never hesitate to use the trochar, and when this instrument has been inserted (leaving the canula behind), it proves valuable in two ways: 1st. As a direct means of escape for the gas, and therefore affords immediate relief; 2nd. By providing a means of introducing our medicine with safety when the animal is unconscious, and there is danger of suffocation if administered by mouth. When the tympany is not excessive, it will as a rule be dispelled by outside friction and kneading, and doses of carbonate or aromatic spirits of ammonia. Acid and offensive eructations may frequently be stayed with small doses of carbonate of soda in a little water, with from 10 to 15 minims of carbolic acid.

When the delirium is present and the patient is violent and convulsed, the administration of Fleming's tincture of aconite in 15 minim doses, or the subcutaneous injection of morphia, is beneficial. Thirst, which is usually attendant on these cases, should be quenched by allowing at intervals a little tepid water or weak gruel; such fluids also assist the action of the medicine.

Supposing, then, the bowels have responded to the medicine, or at all events that the patient is progressing favourably—which is indicated by a firmer and less frequent pulse, deep-drawn breath, followed by more tranquil breathing, increased lacteal secretion, a spontaneous expulsion of urine and *fæces*, a return of consciousness,

* The patient, when once purged, especially in the early stage of the disease, will, in the majority of instances, gradually recover. Nevertheless, it is not absolutely necessary purgation should take place before the animal gets up. I have known apparent constipation to be present until the animal had regained her feet, and then, not until some little time after, a free expulsion of the *fæces* take place. No doubt the difficulty experienced in overcoming this confined state of the bowels is owing to the inactive condition of the stomachs, from the paralysis extending to the nerves supplying those organs; hence the double advantage of diffusible stimulants.

with eagerness to drink, and a desire to rise—our next treatment must be carefully regulated; we must be especially careful to guard against a relapse. It is not wise, therefore, to suddenly suspend the administration of stimulants and take it for granted the patient is safe; nor yet to remove the clothing, or change the temperature, otherwise we may speedily realize how quickly congestion of the lungs (a frequent sequel of parturient apoplexy, and at times an accompaniment) will terminate the animal's life.

The first food offered should be gruel; this may shortly be replaced with bran and linseed mash, and then, time of year permitting, a little green food. If the pulse continues accelerated after the patient has got up, with other slight febrile symptoms, liq. ammon. acet., or a little nitrate of potash in the water, may be given. It is a mistake, so soon as the malady has apparently left the animal and she is up, to commence with a course of tonic treatment, such as iron, gentian, nux vomica, etc. For although she will of necessity be in a weakened condition, strength is far more likely to be gained by good nursing and nourishing food than taxing the stomach with drugs; and if more than this is required, some good sound ale or stout may with advantage be given.

As in all else appertaining to the healing art, nearly every veterinary surgeon has his own method of treatment. In the preceding pages I have given an outline of that with which I have found most success. I am disposed, whether rightly or wrongly, to think that the result of milk fever is too often a foregone conclusion with many veterinarians. I remember an instance where a member of my profession was called in to attend a cow in the very early stages of the malady before she got down, and he at once exclaimed, "Oh, it is a case of milk fever—she'll die." And die she did, for very little he troubled further about her. And it is doubtless through non-success that the disease is so regarded. But if it is not saying too much, may not this repeated disappointment be due to the want of continual watchfulness on the part of the veterinary surgeon? for I hold milk fever to be a disease in which the professional man is only at his post when he is by his patient's side. Then, and only then, can every little change be noticed and treated accordingly. For the person generally left in charge, unacquainted with these changes, or even perhaps the beat of a cow's pulse, is not cognizant of them; and hence when the medical atten-

dant arrives in the morning or evening, it is but to find a considerable change for the worse, if not death. A part, therefore, of our success depends upon our personal attention. Many a night have I sat up, and many a cow have I seen recover that might in my absence have been suffocated in the drenching, or stinted of the brandy by those left in attendance.

Briefly, before closing this section of the work, I will allude to some of the measures (medicinally) adopted by other authorities.

Professor Walley says, "If we find constipation as a probable eccentric cause, we must endeavour, boldly and promptly, to overcome it by administering a full cathartic dose of medicine, not simply Epsom salts or sulphur, but croton, calomel, and aloes, followed by linseed or castor oil, as required. Epsom salts only nauseate, and tend by their refrigerating properties to paralyze the coats of the stomach.* If we have irritation of the uterus we must reduce that irritation. If the pulse is high, the lacteal secretion arrested, and the eye bright and prominent, but bowels regular, we must have recourse to sedatives, and, as the best of all, bleeding, and that fearlessly, followed up by neutral salts, aconite, and camphor, every two or three hours; or if there is much excitement, a powerful dose of the hydrate of chloral, either alone or with opium." He further recommends a solution of belladonna to the udder for the purpose of relaxing the coats of the ducts, and recommends as stimulants ammonia and alcohol, but especially the former; and in the advanced stage of the malady, the tincture of *nux vomica*.

Professor Williams advises bleeding if the pulse be not excessively weak and the heart's action almost fluttering. "Slow and deep breathing, with a tendency to stertor, adds greatly to the necessity of immediate bleeding." He further recommends, whether the pulse be small or full, the administration of a strong cathartic, consisting of Epsom salts, with croton, ginger, or other aromatic; he discountenances the repetition of the cathartic on account of having seen even simple fluids cause tympanitis and death. Ammonia is advocated as a stimulant. "Some practitioners," he

* This statement concerning the effects of Epsom salts is somewhat far-fetched, and I know of no instance where it could be proved that gastric paralysis occurred in the cow to which the drug had been administered.—*J. W. H.*

says, "recommend *nux vomica* to be given every few hours. There is no objection to a single dose of this being given along with the cathartic, but its repeated administration can only do harm; the paralysis depends upon engorgement, and spinal or nervine stimulants in the acute stages of the disease are contra-indicated."

Preventive Measures.—Before concluding this subject, the question naturally suggests itself: Can anything be done to secure our animals from an attack of this dreaded malady? Speaking generally, such a question may be answered in the affirmative, for, knowing the causes, we have it to a great extent in our power to prevent the effect. For instance, if a cow is in high condition towards the time of parturition, and has been accustomed to rich keep, an alteration should be made in her food—a low diet should be substituted. Again, after she has calved care must be taken not to over-feed her; a somewhat spare, unstimulating, and easily-digestible diet being only allowed; and although there may be immunity after the third day, it is even then advisable to bring her by degrees to her accustomed food. It is my custom to administer a dose of aperient medicine two days, as nearly as can be ascertained, before calving, and one as soon as the animal has calved; and when this precaution has been taken I have rarely had a case of parturient apoplexy. We have previously spoken of the obstinate constipation that is present in this disease, and can therefore readily imagine that by having the bowels well open at the time of parturition a good effect will be gained.

The unnatural practice of milking before parturition, and removing the calf for long intervals, has already been commented on. These and other evils tending to produce this malady are all to be averted.

It has been strongly recommended by some practitioners to bleed before calving as a preventive measure. To this, excepting in extremely plethoric animals, I cannot on the broadest principles of reasoning acquiesce.

Sequels.—It not unfrequently happens that a cow, having recovered from the attack of parturient apoplexy, is left paralyzed in her hind-quarters, and consequently is unable to stand. In a case of this description I strongly advise the administration of strychnine, commencing with 1 grain three times daily in a bolus of simple mass, after the second day gradually increasing the dose;

or the nux vomica in 2 drachm doses combined with 2 drachms of sulphate of iron, and given with a pint of sound ale or stout. Galvanism is also sometimes serviceable. Some persons advise slinging, but I am no advocate for this measure in cows, on account of the anatomy of the digestive organs and the difficulty there would be, owing to compression of the abdomen, in rumination. In protracted cases of this lumbar paralysis, a charge over the loins, similar to that used in horses, is serviceable. The position of the animal should be frequently changed, and the urine and fæces mechanically removed from time to time. The moment our patient exhibits restoration of nerve-function, and attempts to rise, she should be assisted by means of a sack placed under the breech, and lifted at either end; and when up, the limbs, especially the hind ones, well hand-rubbed to restore and promote the circulation, which lying so long will have impaired.

Congestion of the lungs, already alluded to, must be treated as prescribed for that complaint.

PUERPERAL MANIA.

This peculiar form of insanity, so well known in human pathology connected with the parturient state, has been occasionally observed in the cow, cases of which have been recorded by Rolls, Storrar, Harms, Robellet, Günther, Landel, and the author.

Causes.—Among these may be named: a disordered state of the digestive organs, constipation, suspended or irregular uterine and lacteal functions, debility, plethora, sudden fright, excitement, prolonged absence of offspring (especially when there is an abundant secretion of milk), deranged cerebral circulation, and other conditions favourable to brain and nervous irritation.

Symptoms.—The disease may occur within a few days after calving, or not until some weeks have elapsed; i.e., it may, as in the human subject, take place during the period when the system has not recovered from the shock of parturition, or during the depressing effects of lactation.

Extreme restlessness, a wild expression of countenance, with sometimes a peculiar tremulous condition of the head, are usually the first observable signs of puerperal mental disturbance. Very

speedily the animal becomes violently excited, regardless of its offspring, bellows loudly, foams at the mouth, champs the jaws, seizes various objects within reach, bites itself, rushes frantically about, falls exhausted and gasping, or in a state of semi-coma. After a short interval the scene is again enacted with increased fury. The eyes are fixed, prominent, and blood-shot, the pulse hard and quick. The lacteal secretion is usually suspended and the bowels torpid. What appetite exists is generally of a morbid character, uncleanly food, and even filth, being preferred to that which is wholesome and good.

The disease may either decline after a violent paroxysm or with attacks gradually diminished in force.

Treatment.—In having recourse to remedial measures it will be obviously necessary to direct attention to the probable cause of the mania. If indigestion or constipation exist, purgatives and stimulants are indicated, suspended uterine and lacteal functions are to be overcome as speedily as possible.

Debility necessitates the administration of tonics. Plethora, depletion. Sudden fright and excitement, soothing measures. Secondly, the irritation of the brain and nervous system is to be allayed; to accomplish this, chloral hydrate stands pre-eminent. Strict quietude should be observed throughout, and particular attention should be paid to the diet.

AGALACTIA.

Agalactia, or absence of milk in the mammary gland, is not unfrequent in the cow. It is more particularly met with in aged animals which have for some time not bred.

Causes.—Suspended breeding, general debility, exhausting disease, defective mammary development, and acute or chronic disease of the mammary gland.

Symptoms.—An abnormally soft, pendulent and small udder; the emission of a thin, yellowish, scanty fluid on drawing the teats, "followed sometimes by a few drops of white watery fluid."—*Fleming.*

Treatment.—"This must chiefly consist in giving good food, particularly of a leguminous kind, with aniseed and fennel,

seeds, water-fennel, *meum nutellinum*, antimonials, and other agents which are likely to stimulate the secretory function of the mammae. Great attention must be paid to the digestive organs, and the teats should be frequently stripped and the mammae rubbed, either dry or with some stimulating application."

"Macorps" (Canstatt's *Jahresbericht*, 1860) "records a case in which the udder was rubbed with brandy, friction applied to the abdomen, and warm milk and fennel-seeds administered; in two days the milk began to appear."—*Fleming*.

CHAPTER XVII.

DISEASES AND ABNORMALITIES OF THE MAMMARY GLAND AND TEATS.

Mammitis.—*Gallactorrhœa.*—*Over-stocking.*—*Premature Lactation.*—*Im-perforate Teat.*—*Fissures in the Teat.*—*Fistula in the Teat.*

MAMMITIS.

MAMMITIS, or inflammation of the udder, commonly called garget, is an affection to which cows and heifers are prone at any period, and from a variety of causes. The inflammation usually commences in one quarter of the gland, to which it may be limited, or it may, and frequently does, extend to the corresponding glands, or in severe cases the whole of the udder may be involved. The disease may be acute or chronic, superficial or deep-seated. Frequently mammitis takes place soon after calving, and as frequently before and long after. An acute case yields moderately soon to treatment, but if allowed to degenerate into a chronic condition, is untractable and tedious.

Causes.—Among these may be enumerated external violence, as blows, kicks, gores, bruises, etc.; a too plethoric condition of system, insufficient and careless milking, over-stocking, over-driving with distended udder, cold after calving (it has occurred from metastasis in pneumonia), lying out late in wet pastures, or during hoar-frosts. Heat also has been alleged a cause, and this in new milched cows, in full habit of body, may be easily accounted for, when we remember that the blood which has hitherto been supplying the fœtus in utero with nourishment, is suddenly, after parturition, diverted into new channels for the production of milk; the mammary gland receives an increased supply of blood, and, as a consequence, increased vascularity and sensitiveness, and becomes more susceptible to take on inflammatory action. And the same reasoning will apply to the effects of cold, which, in suddenly

checking the increased circulation consequent on the change after parturition, produces congestion, and lays the foundation for mammitis. Also the sores resulting from foot-and-mouth disease, improperly attended to, allowed to extend up the milk duct of the teat, and into the substance of the gland, have not unfrequently caused severe mammitis and the loss of a quarter.

Symptoms.—Enlargement of the udder, with heat, redness, tenderness, and a hard, consolidated feel of the part more particularly affected, attended not unfrequently, when the hind-quarters are attacked, with a straddling gait. The subcutaneous veins are distended and corded. On drawing the teat, instead of normal milk issuing, a thin yellowish fluid is passed, which, as the disease proceeds, becomes denser and fœtid, and mingled with it curdled lumps, due to an acidulated change in its composition. The constitutional disturbance is often considerable, indicated by a quick pulse, increased breathing, rise of temperature, suspended rumination and appetite, a decrease in the quantity of milk from the unaffected quarters, and irregular evacuations.

As the disease proceeds, all these symptoms become augmented; the udder increases in size, the hardness gives way to a soft, pitting feel, resulting from the formation of pus, which, if allowed to find an outlet itself, leaves behind a ragged, sloughing wound. To this succeeds mortification, induration, or atrophy, the finale of which is a partial if not total loss of the quarter; or the former may extend to the whole gland, and cause the death of the animal. It is, nevertheless, surprising the amount of pain and suffering cattle will go through without a speedy and fatal termination, in comparison with other animals, particularly the horse.

Treatment.—If taken in hand early, hot fomentations, camphorated oil or soap liniment, with a little turpentine or ammonia rubbed gently in, and the administration of a saline aperient, will often restore the gland to its normal condition. Some authorities recommend poultices in preference to fomentation, as a saving of time and preventive of reaction. Individually I have no objection to their use if properly applied, but as in many instances they are seldom found in direct contact with the diseased part, a space intervening between the poultice and the gland, it is, I think, the safer measure to prescribe fomentations. The poultice may be composed of bran, linseed-meal, oatmeal, marsh mallows or boiled

turnips, but certainly, though perhaps it is scarcely necessary to say it in a work of this kind, not cow-dung, the noxious favourite of the farrier and cow-hind. Among those enumerated linseed-meal undoubtedly stands pre-eminent. Where the pain is acute the poultice may be made sedative by adding scalded poppy-heads, laudanum, opium, or extract of belladonna. If suppuration has commenced, we should endeavour to direct the matter into the milk-passage of the teat, and this may be often done with a syphon; if, however, it will not pass through this instrument, then gently drawing with the hand or the natural suction of a calf should be tried. Should these measures fail, and an abscess form, externally or deep-seated, the contents must be evacuated with a lance, and the sac cleansed with a syringe and warm water (slightly carbolized 1-60), and afterwards dressed with a mild stimulating liniment. *Under all conditions of mammitis the udder ought to be suspended.* If the animal is in high condition or plethoric, the abstraction of blood from the jugular will be beneficial, or it may with great advantage be adopted locally from the corresponding mammary vein. Bouley recommends leeches. Small doses of laxative and febrifuge medicine should be given occasionally:

Magnes. Sulph.....	8 ounces.
Potass. Nitrate	1 ounce.
Antim. Tart.	1 drachm.
Zingib.	$\frac{1}{2}$ drachm.

In tepid water.

The diet should be light and easily digestible, as gruel, mashies, linseed, pulped roots, and such like.

In the event of mortification, prompt measures are indicated for the prevention of septikæmia, and for the removal of the gangrenous mass. To accomplish this, antiseptic dressings should be freely employed, as chloride of zinc or carbolic acid, the latter being, in my opinion, the most valuable. At the same time the internal administration of tonics and stimulants is called for—tinct. ferri, brandy, spts. æth. nit., arom. spts. ammon. or ammon. carb.—while a thoroughly supportive diet should be allowed.

The removal of the gangrenous portion of the gland is usually effected by excision; in some cases it is necessary to ligature the larger vessels, and subsequent hæmorrhage may be stopped by

plugging with tow saturated with tincture of iron, or in urgent cases by the application of the actual cautery. After excision the parts should be daily syringed with carbolized warm water, and healthy granulations encouraged by stimulating liniments or, from time to time, lunar caustic.

When induration of the gland follows mammitis, denoted by a hardened insensible condition of the part, which may be in one circumscribed mass, or, as is frequently the case, in irregular and separate nodules, in other words indurated lobules, the following ointment will be found useful :

Vaseline	} aa.....	4 ounces.
Soft Soap		
Camphor Ointment.....		2 ounces.
Iodine		1 ounce.
Extract of Belladonna.....		$\frac{1}{2}$ ounce.

Rub in gently for five minutes daily. Dry friction is also serviceable.

"As a preventive measure when infection is apprehended—as in retention of the placenta, metritis, or vaginitis, etc.—it is advisable to inject a weak solution of carbolic acid ($2\frac{1}{2}$ per cent.), or alum (2 per cent.), up the teat by means of a glass syringe, always after milking; the fluid should be of a temperature of 95° Fahr. Franck has proved the value of this precaution, and also its utility as a remedial measure; indeed, Armatage had previously recommended the injection of weak solutions of carbonate of soda or potash in mastitis. Franck has employed a 10 per cent. emulsion of carbolic acid as an injection in artificially produced mastitis (60 grammes daily), and by this means suppressed the development of micrococci and bacteria in the milk, as well as prevented curdling of that fluid in the ducts and sinuses. Solutions of alum—10 per cent., 100 grammes injected daily—appeared to be also beneficial in this direction."—*Fleming's "Obstetrics."*

GALACTORRHOEA.

Galactorrhœa (from *Γάλα*, milk; *ῥεω*, to flow)—*superabundant secretion of milk*. This is a condition occasionally witnessed in the cow; and in these days of *just and deserved prosecution for*

'*over-stocking*,' it is essential the affection should find a place in this work, and its causes and nature be explained. A cow in a field, market, or fair may be observed *dripping* her milk, and an innocent and humane person may be summoned and put to considerable annoyance and expense by an inexperienced but equally well-meaning inspector for having insufficiently milked the animal, or not having done so at all.

Causes.—As will have already been gathered, galactorrhœa is due to a superabundant secretion of milk; but it also frequently results from a primary relaxed condition of the sphincter of the duct; in other words, diminished contractile power. Such a relaxed condition, however, it must be admitted, is also a secondary result of excessive secretion and prolonged lactation. Cows with long, hanging, flaccid teats, and large cul-de-sacs or reservoirs at the base, and which have had several calves and are heavy milkers, are those generally subject to this condition.

Symptoms.—A continual *oozing* of milk, *rarely* a forcible jet, and then only in neglected milking, or shortly after calving. The teat is pendent, flaccid, and wrinkled; not straight, smooth, firm, and pointing outwards, as in abnormal distension of the gland. Milk, poor in quality as the condition continues. The animal is more or less anæmic, indicated by pallid mucous membranes, weak pulse, low temperature, and lassitude; whilst there is *no distension* or *cordiness* of the mammary veins as seen in over-stocking. Such animals usually drink large quantities of water, have capricious appetites, and suffer from indigestion, and finally become dropsical.

Treatment.—This consists in applying compression to the mammary gland and teats, and imparting tone to the system. The first is fulfilled by suspending the udder, and investing it in an elastic net, and applying elastic bandages (miniature human leg bandages) on the teats; and the latter by the daily administration of mineral tonics and nourishing food.

OVER-STOCKING.

Having in the preceding subject alluded to this condition, it will be, I think, necessary to make a few general remarks concerning the practice. It is and ever has been, in my opinion, an act of cruelty

to allow a cow's udder to become so distended with milk from long retention that the secretion is not only increased in temperature to a degree indicating fever, but that the contractile power of the duct being no longer sufficient to restrain it, it is forced out in the unhealthy condition invariably found. However elastic the tissue may be that supports the mammary gland (and it is undoubtedly very elastic), this tissue must be strained far beyond its natural limits ere an overflow of milk, forcibly injected, can take place. To those ignorant or unfeeling individuals who argue that the pain resulting from over-stocking is exaggerated, I would ask them what is the effect of a distended bladder, and when such distension is protracted? Only one answer can be given, and the same to a greater degree will apply to the mammary gland. What is more painful to a nursing woman than long separation from the suckling infant? Animals have their feelings as strong as human beings; and independent of maternal suffering, the new-born offspring equally suffers from protracted starvation in order to deceive the public as to the milking properties of the tortured mother. Thus the practice is fraudulent as well as cruel. But as Professor Williams remarks, "Not contented with allowing the gland to become filled until it can no longer contain the milk, the natural provision for relief, namely, 'spontaneous flow of milk,' is prevented by plugging the teats with cobbler's wax or gutta-percha."* Some scoundrels go even further than this. They have a mould made to resemble a most symmetrical udder, with the teats in a perfect position, which is fastened below the udder, the animal being put in a frame made for the purpose, and as the gland becomes distended with milk it is thus moulded into the required shape. This is a species of cruelty that the law of the land ought to suppress. It is often followed by violent inflammation, resulting in the obliteration of one or more quarters of the gland, or even by gangrene."

Very lately a cow was removed out of the show-ring for having goose-quills inserted in the teats; the disgrace, however, of disqualification is a minor matter with such fellows compared with

* Latterly, a more artistic method has been discovered, and is extensively practised. The process consists in covering the teat, after it is first manipulated into proper shape, by a solution of white gutta-percha, or collodion, which rapidly dries and renders the flow of the milk impossible.

what should take place, viz., prosecution. I cannot but think that any man who has one spark of feeling in his breast for the dumb animal which it is his privilege to own, attend or prize, and one whose valuable properties are far too great to be abused, must, if he has common sense and studies his own interests, see, whether looking at it professionally or otherwise, that the system of overstocking cows, especially to the extent it is now carried on, is without doubt both unnatural and cruel, and injurious to the beast. If custom is to decide such cases, it is but of little use having a Society for the Prevention of Cruelty to Animals—a Society whose aim it is to protect from unmerciful hands some of the noblest works of creation, and one which England has justly cause to be proud of.

If we look through veterinary jurisprudence generally, we may think the evidence of veterinary surgeons not perhaps so strong as it might be, and perhaps as a rule the nature of the complaint or charge is not gone so fully and scientifically into as when discussed amongst members of the profession themselves; possibly a feeling of reluctance is displayed, owing to the injurious impression such evidence it may be thought will create in the minds of clients or prospective ones; but

‘ Mercy, to him that shows it, is the rule
And righteous limitation of its act.’

No pecuniary motives or sentiment should ever interfere with a professional man's duties, and more especially where the wilful infliction of pain is the point at issue.

PREMATURE LACTATION.

The secretion of milk has been observed in animals not pregnant, and which have never been fecundated. Very young heifers have been known to develop the mammary secretion, and to increase its quantity by self-suction. In such cases the animal should be put to the male as early as possible, or otherwise suitable hygienic measures must be resorted to.

IMPERFORATE TEAT.

This abnormality is occasionally met with in the cow, or rather heifer, a condition usually unnoticed until at the time of or immediately after parturition, when the fulness of the quarter and the inability to draw milk leads to an examination and the discovery of the imperforation. It is generally confined to the terminal portion or end of the teat, and may be easily remedied.

Treatment.—This consists in puncturing the end of the organ immediately in its centre with a small No. 2 human trochar, sufficiently high until the milk runs through the canula on the withdrawal of the stilette, and for a week or two afterwards the quarter should be evacuated with a syphon until the artificial opening has properly healed. A small bougie smeared with zinc ointment and introduced into the sinus will expedite the healing.

FISSURES IN THE TEAT.

Fissures, or "cracks," are frequently present in the teats of the cow, and if in the first instance they are neglected, their healing proves troublesome, and owing to the soreness of the parts milking is performed with difficulty, and the animal may in the end become an inveterate kicker and untractable milch cow.

Causes.—Continual sucking, especially when the gland is empty, whereby the skin becomes tender and abnormally vascular; cold, filth, acridity of the young animal's saliva, and vesicular eruptions (foot-and-mouth disease), may also give rise to fistula.

Treatment.—In the early stages, when there is an indication of soreness, the teats should be washed with warm water and carefully examined; if there appears any redness or superficial cracking, they may with advantage be anointed with the following ointment.

Alum Pulv.	1 drachm
Vaseline	2 ounces

When fissures have developed they should be gently fomented with carbolized warm water, and afterwards dressed with the ung. zinci oleas, when usually a speedy cure will be effected. During

the treatment of the fissure the calf should be prohibited from sucking, and the milk drawn with a syphon. From time to time the parts may be touched advantageously with nitrate of silver.

FISTULA IN THE TEAT.

A fistulous wound or sinus communicating from without the teat to the milk-duct, whereby the milk instead of issuing through its proper orifice is evacuated through the side of the teat, is a somewhat troublesome condition, and usually arises from injury or disease, not unfrequently from extension of the vesicular sore in the foot-and-mouth complaint.

Treatment.—The most rapid cure will generally follow incision of the sinus with a small bistoury, the daily injection of iodine or sulphate of zinc lotion, and the occasional application of nitrate of silver. During lactation, however, curative measures are always more or less impeded, and it has been recommended by other authorities to await the cow being “dry” before adopting treatment.

"The duration of the disease in the bovine species seldom exceeds from four to seven days; and, as in other creatures, the termination is always fatal."—*Röll*.

ewe; in a few more days the third calf and the second sheep—a ram. The first calf exhibited the most perfect quietude when any person stood near it; but when left alone it bellowed furiously, and, as far as the chain would allow, it mounted the manger or stall partition, or would sometimes jump with all feet at once from the ground to a considerable height, and fall helplessly on the ground, lying a few seconds upon one side, and rising with difficulty after several ineffectual attempts. The second and third animals were considerably more vicious; they would kick and run at all persons who approached them. Their loud bellowing became constant and annoying, and, in the end, differed little from the braying of an ass. . . . It is to be particularly remarked that the wounds inflicted by the rabid dog had in every case healed up; but, contemporaneously with the first signs of rabies, loss of appetite and difficulty in swallowing, etc., there arose such an intolerable itching or irritation in the parts that the animals commenced to rub them violently against the nearest object, until they were raw and bleeding."—Armatage, "*Clater's Cattle Doctor*," p. 453. "During the epizooty of rabies in Lancashire in 1869, Mr. Worthington, veterinary surgeon, of Wigau, reported four cases of the disease transmitted to cattle. On Sunday, November 28th, he was called to inspect a heifer, two years old, and in calf, which had been observed to be dull and to separate from the herd in the field on the preceding Thursday. On the Friday the owner's attention was again attracted to it by observing its face and horns covered with soil; it was then labouring under great excitement, had a wild and startled look, bellowed frequently, and occasionally charged furiously at its companions; a great change was also observed in the abdomen, which presented an extremely hollow, almost emaciated appearance, as if it had been starved. It was placed in a loose-box, and the excitement and restlessness were almost continuous. The creature was ever on the alert, and would instantly charge at anyone who entered. A large quantity of frothy saliva hung from the lips, and the bellowing was almost incessant. All food was refused, but the thirst was great, and when gruel or water was supplied eager attempts were made to drink, but swallowing was impossible. On Monday the wild excitement had almost completely subsided, and was succeeded by comparative quietude and extreme exhaustion. The eyes had a peculiarly anxious but watchful look; the pulse was slow and feeble, and the debility was so great that the cow could scarcely walk, though it manifested much anxiety to escape from confinement. The thirst continued undiminished, and on a bucket of gruel being presented, the poor beast eagerly plunged its nose in it, and made repeated but vain efforts to drink, the liquid at each attempt returning by the nostrils. It rapidly sank during the day, and died early next morning; but its restlessness only diminished with the fast-failing strength, and was observable to the last. Throughout the disease there was little or no action of the bowels, and everything except fluids was persistently refused from the commencement.

"The second case was a two-year-old heifer, in calf. The owner had noticed it first from its strange appearance and conduct in the field; it

Diagnosis in the Cow.—"The nervous disturbance that sometimes marks the commencement of 'cattle plague' (rinderpest) in

looked remarkably hollow, and instead of grazing with the other cows, stood with head erect, looking wildly towards various parts of the meadow, apparently intently watching some imaginary object. It would stand in this way until its companions had grazed some distance, when it would walk up amongst them, and again resume its attitude of suspicious watchfulness. As yet there was no desire to do mischief, and throughout the disease it would permit any of its companions to approach; but on the following day it made a fierce attack on some young calves, and became perfectly furious on seeing a dog which was kept at the farm for the purpose of driving cattle to and from pasture, and towards which it had never before displayed any indication of animosity. At length it manifested such alarming symptoms of violence that it had to be secured. Before entering the place where it was, the owner advised Mr. Worthington to be cautious in approaching it, as any attempt to do so strangely excited it; and this precaution was necessary, for they were almost deafened with the bellowings that greeted them as they opened the door. Their entrance had thrown it into a state of the wildest excitement, which, however, subsided after their quietly watching it for a few minutes; but the slightest movement, or even an attempt at conversation, instantly brought on a paroxysm of bellowing. The eyelids were widely dilated, and the eyes bright and prominent, giving the cow an extremely wild and startled expression; a quantity of frothy saliva adhered to the lips, and with head erect and ears pointed forward, it stood keenly sensitive to everything around. In its struggles to liberate itself one of its horns had become fractured, and the blood streaming over the face considerably increased its startling appearance. There was no disturbance of the pulse; and both bowels and kidneys were acting naturally. From the commencement all food had been refused, and there was also an indifference to fluids. The paroxysms increased in intensity, and the remissions were of short duration; the bellowing could be distinctly heard at a distance of two or three miles. The animal was destroyed three days after the appearance of the first symptoms.

"A fortnight afterwards this veterinary surgeon was called to see another cow, older than the others. It had been unwell for two days, and had not eaten anything. The principal symptoms were extreme coldness of the whole body; a small, quick, feeble pulse, drowsiness, and a great desire to eat its clothing. Although food of every description was persistently refused, this cow had deliberately masticated and swallowed a large portion of the horse-rug and some sacks that had been placed upon it. Two days afterwards it was seen again, but it was then dying. The pulse was almost imperceptible, very quick, and irregular; the breathing low and slightly stertorous; the whole surface of the body icy cold; a copious flow of saliva from the mouth, and intense depression. Though evidently fast sinking, there was still the same depraved appetite and unnatural desire to eat the clothing. It died a few hours afterwards. Five weeks before its death this animal, whilst being driven to a neighbouring field, was attacked by a large dog that was passing along the road with a half-worried cat in its mouth, and bitten rather severely on one ear. The wound did well, but two days before the

cattle offers a certain analogy to the symptoms of rabies in that animal. The fits of delirium that now and again appear in that disease, as well as the great depression and apathy, and the unsteady gait, have a resemblance to those present in a certain stage of rabies. But this resemblance is very superficial; the existence of the 'plague' in the district, the appearance of the visible mucous membranes, and other definite symptoms during life, as well as the pathological alterations found after death, are sufficient to establish a distinction. We will hereafter refer to the diagnosis of rabies from the various forms of 'Anthrax' in this and other animals."

cow was seen by Mr. Worthington it was observed to be charging a number of sheep, and bellowing in a strange, unnatural manner. From this time till death ensued paroxysms of bellowing, accompanied by great restlessness and excitement, would come on at intervals. These periods were succeeded by the greatest depression.

"The fourth case was a bull calf, nine months old, on a farm where the other cases occurred, and to which Mr. Worthington was called the day after the death of the last case. Since the Monday—three days previously—it had exhibited unusual symptoms. The Croston harriers had on that day passed through the field in which the calf was grazing along with about a dozen other calves, and shortly afterwards it was found bellowing and rambling over the field in a state of the greatest excitement. It was supposed at the time that this had arisen in consequence of having been alarmed by the hounds, and would subside in a short period; not being a valuable calf, it was neglected until the arrival of the veterinary surgeon, three days afterwards. It had then separated from its companions and could not be found until diligent search was made, when it was discovered lying dead on the bank of a small pit, with its nose just immersed in the water, having apparently expired in the act of drinking. Since the Monday it had been in a state of the wildest excitement, incessantly bellowing and rambling round the field, and charging furiously at anyone who approached it. Shortly before daybreak on the 8th November, the shepherd, on going his morning rounds, had observed a large black dog, which he described as looking 'fearfully hollow and hungry,' in a field adjoining the hall, and which, after attacking his own dog, crossed the fence into the contiguous field, where the calves were grazing, and ran in among them. It was not sufficiently light to observe whether it attacked any of them, but he thought it probable it might have done so, as he could distinctly observe all the calves running from it in a state of alarm. About the same time this dog also severely wounded a sheep-dog at a farm about a mile off; the owner, apprehensive of rabies, tied this animal up, and two or three weeks afterwards it died, presenting unmistakable symptoms of rabies."—*The Veterinarian*," vol. xliii. p. 195.

TETANUS.

Tetanus (*τείνω*, to stretch) consists of, or denotes, an uncontrollable spasmodic contraction of the voluntary muscles. It is exceedingly painful,* and usually fatal.

This disease is comparatively of rare occurrence in cattle practice. It is divided into *idiopathic*, *i.e.*, where no visible cause is in existence; and *traumatic*, when it arises from injury or wound.

Tetanus may assume a local or general form, *i.e.*, it may be limited to the jaws, producing *lock-jaw*; or it may extend to a part or the whole of the trunk, and give rise to partial or general rigidity.

Causes.—Changes of temperature, exposure to cold and wet, excessive fatigue; injuries by wounds or bruises,† irritation to the

* I have heard it frequently argued that tetanus is not a painful disease, and that in the horse the profuse perspirations which accompany it are merely the result of absolute fear. This theory I cannot subscribe to, and never have agreed with. I do not for a moment dispute the presence of fear, or that it is a cause of perspiration; but my reply has always been that pain must be, at all events for a time, an inevitable result of sudden and inordinate stimulus by the nerves supplying the muscles so affected. Long-continued pressure may, and we know will, in time produce numbness or paralysis; but in tetanus there being remissions of convulsion, each sudden contraction when a spasm comes on must produce intense pain.

† On the 5th February, 1880, I was summoned to a milch-cow belonging to John Jones, Esq., Mayor of Wolverhampton, supposed to be suffering from stoppage of the bowels. On my arrival I found the animal presenting all the aggravated symptoms of tetanus—the jaws completely locked, the head and neck extended, the whole body rigid, and in turning the most fearful excitement was manifested, and the creature fell down in a piece. She strained excessively, passing nothing but flatus, but this I attributed more to excitement than stoppage, or from some irritant within. I was at first under the impression that exposure to cold in the field during the day had given rise to the tetanus, but of this I was hereafter undeceived. An aperient was administered, counter-irritation applied to the spine, and perfect quietude enjoined. On my arrival next morning, she was still lying; the neck was not so rigid, and the jaws were relaxed the least degree; still the nose was carried out and the haw protruded over the eye on turning the head; some small portions of feculent matter, coated with mucus, and hard, had been evacuated; the straining still continued, and there was more evident internal irritation and pain. I ordered a little febrifuge medicine, and quietude as before. In the evening she appeared decidedly better, the rigidity had disappeared, the neck was flexible, and the jaws could be opened some distance without excitement, and the straining was absent. She was, however, still

nerve extremities, or main trunks, the presence of irritants in the stomach and intestines ; strychnia.

unable to rise. No further passage of faeces having taken place, I ordered enemas, and no food beyond gruel. Early the following morning she was found dead, and had doubtless expired in great agony. She was lying squat on the abdomen, the hind-legs stretched out on either side behind her, the hocks flexed and the toes dug into the ground ; the rectum was considerably protruded and red, and the vagina partially inverted ; the head was twisted round sideways to the right, and the face distorted. The poor creature had evidently died straining violently.

A post-mortem examination revealed the heart loaded with black blood ; the bloodvessels generally were gorged with black sticky blood ; lungs and liver congested ; the gall-bladder distended and containing two or three half-pint bottles of bile, nearly black and like treacle. Within the stomachs was a large quantity of fluid ingesta, and there existed no stoppage throughout the intestines, but there was slight inflammation of the terminal portion.

At this stage I left the subject, taking with me for examination the bile and the portions of the heart. When at home, thinking the case over, the thought suddenly flashed across my mind as to the cause of the violent straining, that perhaps the animal had sustained some vaginal injury, probably, as I suggested, maliciously. I therefore again visited the yard, and had the vaginal passage carefully cut out and laid open, when the origin of this symptom and the consequent lock-jaw was at once palpable. Three lacerated wounds, one of which completely penetrated the wall of the vagina, were present. One existed on either side of the vagina, the third on the floor between ; the nearest was about five inches from the orifice. Considerable inflammation existed for some distance beyond, with serous effusion ; through the ruptured wall was a large amount of clotted blood. The injury had doubtless been caused by the violent insertion of a stick, or some similar instrument. At present the committant of the brutal offence is undiscovered, but it is to be hoped the culprit will be brought to justice and punished as he richly deserves.

TRAUMATIC TETANUS IN A COW. By M. P. Caillat.—“This affection,” the author says, “is very rare in animals of the bovine species. The cow in question, of the Charolais breed, had received an injury at the base of the horns from a cord attached to a board to prevent the cow from seeing far before her, to keep her from straying out of her pasture ; unperceived this cord had remained in the wound for some time ; the cow was seven months in calf. The symptoms were : The head and neck extended ; the muscles of the cervical region were so hard that not the slightest impression could be made on them with the fingers ; the ears were stiff and erect, and when depressed by force would straighten themselves with a bound ; the eyes were fixed ; pupils contracted ; nostrils dilated ; the trismus was so intense that it was impossible to open the mouth ; the outer surfaces of the cheeks were puckered from the rigidity of the masseter muscles ; all the other muscles of the body were similarly contracted. She stood with her fore-legs wide apart, and hardly flexed her limbs when made to move. The spine flexed still slightly on pressure being applied ; the tail was elevated from the perineum ; the motion of the hind-legs was very limited, and a sort of muscular tremor followed

Symptoms.—These are given by Dobson as follows: "The symptoms of tetanus are, in the earlier stages, not easily observed;

every attempt at locomotion; the voiding of the excrements and the urine, though difficult, was still effected. From time to time a particular noise was heard in the oesophagus, the result of the expulsion of the gas from the rumen, which was somewhat distended. It was afterwards found necessary to puncture it, to liberate the gas, leaving the tube in the opening.

Treatment.—From 45 to 50 grains of laudanum were administered by injecting it repeatedly into the mouth by means of a small syringe, it being diluted with some decoction of marsh-mallow, and about the same quantity of ether. The wound was dressed with laudanum; frictions with camphorated oil and laudanum were made along the spine and masseter muscles. Fumigations were also made under the belly with pailfuls of boiling water two or three times a day; hot bags were put on the loins, and dry friction was resorted to.*

"The trismus increased to such a degree that the animal could hardly flex the joints of the fore-legs, and it fell rather than lay down. This state of things went on from the 9th of June, increasing in intensity to the 16th, when the trismus was so intense that the respiration reached 70 per minute, and sometimes even 80. The same treatment was continued to the 21st, with the exception of adding some glysters containing 5 grains of laudanum in each. The patient now began to get better, the trismus relaxed, she was able to drink some flour and water, the decubitus was easy, the tremors ceased. The dose of laudanum was now decreased by one half, and afterwards replaced by the cyanuret of potassium, 10 centigrammes of which was administered daily by being put on the tongue. From the 24th she had begun to eat, but rumination did not take place until the 2nd of July, when she was discharged cured."—*Veterinarian*, 1868.

Surely this was a case of *vis medicatrix naturæ*, a result scarcely to be looked for under the irritation the patient was subjected to.—J. W. H.

TETANUS IN A FOUR-YEAR OLD HEIFER. By E. Creswell, M.R.C.V.S., Yeovil.—"On the morning of the 26th of October, I was requested to attend a four-year-old in-calf heifer of the Devon breed, which the man informed me had been mawbound from the previous Friday, the 23rd. On my arrival I found the patient apparently in acute pain; the back was arched, and the tail held straight out and quivering; on taking the pulse I found it was very little altered from a normal condition, either in character or number. On endeavouring to open the animal's mouth I at once discovered the true malady which my patient was suffering under. I informed the owner at once, and stated the probability of the result being unfavourable, when, to my surprise, the man in attendance said he had endeavoured two or three times to force the poor brute's mouth open with a stick, but with an unsatisfactory result.

Treatment.—As the jaws were quite closed I asked my client for a wine bottle, and administered at once the following:

* No wonder the trismus increased after all the tormenting of the poor animal.

and it is to this fact that we are indebted for so many fatal cases, for generally, before the professional man is consulted, the disease

"R. Mag. sulph. $\frac{1}{2}$ pound, aquæ tepid 2 pints, and an enema of tepid soap and water, ordering that the patient be not in any way disturbed until next visit. I saw my patient again in the evening, and gave her the following : R. Spt. æth. nit. 2 ounces, ol. tereb. 1 ounce, ol. lini. 1 pint ; another enema of soap and water was thrown up. I then left her for the night, ordering that she should be kept perfectly quiet.

"27th.—I visited my patient this morning, and found the symptoms unabated and the jaws still closed. I administered a stimulating draught as well as the animal could suck it down ; this was followed up by an enema of the following : R. Acid. hydrocyanic 1 drachm, aquæ tepid 1 glass ; after staying with my patient half an hour without any visible change I again left, saying I would see her again at night. I found upon again visiting her a great amount of tympany present. I at once administered the following : R. Spt. ammon. arom. 2 ounces, gruel $\frac{1}{2}$ pint, which was taken with difficulty. The same quantity of hydrocyanic acid in enema as in the morning. I stayed about an hour and a half, and finding the animal not relieved by the draught, I had recourse to paracentesis abdominis, by which my patient was immediately relieved, and as the symptoms of tympany did not again appear, I left her for the night. The same treatment, viz. stimulants and the hydrocyanic acid injections twice daily, was continued until the 30th, when my client told me he considered the case hopeless and would not go to any further expense. Thinking it a very interesting and rare case, I wished him to allow me to continue with it, which I did for two days in the same manner as before, when the bowels became quite relaxed, and the animal was able to suck up a little wet bran. The medicine and enemas were gradually discontinued, and the animal was enabled to eat freely ; the stiffness of the tail and limbs continued for more than three weeks before it passed off, which it did all at once. As tetanus is, to my observation, very rare in the bovine species, perhaps the same may apply to my professional brethren, and therefore renders this case more interesting. It was clearly a case of idiopathic tetanus, there being no sign whatever of any lesion externally."—*Veterinarian*, 1869.

CURIOUS CASE OF TETANUS IN A COW, RESULTING FROM AN ACCUMULATION OF FOREIGN BODIES IN THE OMASUM. By T. Newton, M.R.C.V.S.—"On February 9th I was called to see a roan cow, seven years old, which had calved her fifth calf a fortnight previously.

"The symptoms were as follows : Pulse 50, wildness of the eye, extremities warm, bowels obstinately constipated, and the jaws closely and firmly fixed. Treatment—an aperient draught, with counter-irritation to the spine.

"10th.—Symptoms unchanged, and the aperient had not acted ; therefore another drink was given at 7 a.m. with injections ; at 7 p.m. the bowels had not acted, and a quart of cold-drawn linseed oil was administered, which acted during the night.

"11th.—There was an improved appearance of the countenance, but no relaxation of the jaws. Pulse 45, bowels acting well ; hydrocyanic acid was given without any perceptible effect.

"12th.—No alteration for the better at 7 a.m. ; hydrocyanic acid continued ; at 8 p.m. the animal was much weaker.

has such fast hold of the system as to render futile any efforts for relief. In the earlier stages the animal will be observed by the attendant to be somewhat *stiff* in its gait, and to protrude its nose more than usual, which, however, being set down for that very convenient complaint, 'only a cold,' no notice is taken. The next day the neck is stretched out, and the nose protruded, and turning is accomplished with difficulty, and 'all in a piece;' and finally, upon introducing the hand into the mouth, the jaws are found incapable of opening more than an inch or two.

"In the next stage the disease shows itself in all its fearful violence; the jaws are firmly locked, scarcely the point of a stick can be pushed between the firmly clenched teeth; the haw is protruded over the eye, the legs are propped widely apart, and the tail elevated; the head is raised, and the nose cocked into the air; and, above all, there is that anxious, distressed look so characteristic of the disease.

"The nervous excitement is now fearful to witness; the least noise or touch brings on a terrible paroxysm, and if the poor animal falls he is incapable of rising. If assisted to do so he must be raised all in a piece, looking somewhat like the wooden horses seen in the toy-shops.

"The bowels are constipated, partaking, in fact, of the spasm which possesses the rest of the system. The appetite, strange to say, is little affected, and the poor animal will eat as long as mastication is possible."

Terminations.—Tetanus more frequently terminates fatally than otherwise. Death may result from asphyxia, exhaustion, or—though

"13th.—The same treatment continued.

"14th.—The animal now showed decided symptoms of sinking, and aconite was given instead of the acid.

"15th.—Symptoms of sinking decidedly more marked; the same treatment was still continued, the bowels remaining regular.

"16th.—On this day the case was deemed hopeless, and the animal was destroyed.

"*Post-mortem Examination.*—On the left side of the cardiac orifice of the stomach was a pouch of similar structure and size to the manifold. This pouch was found to contain a quantity of sand, small stones, buttons, and pins, to the extent of two pounds in weight. The stomach and adjacent parts were in a state of congestion, and the manifold was completely empty. The digestive stomach and all the other viscera were in a healthy state."—*Veterinarian*, 1869.

I believe it to be exceedingly rare—spasmodic contraction of the heart.

Post-mortem Appearances.—These vary somewhat; most frequently the spinal cord and its membranes are congested; occasionally the brain and dura mater exhibit a similar appearance, but more particularly so in general and protracted tetanus. In cases of traumatic tetanus, this condition is more apparent in the nerve-tissue near the seat of injury, and which often extends some considerable distance, while the muscles in the same locality are soft, dark, and gorged with blood. In severe cases they are sometimes ruptured.*

* Dr. Gant in his "Science and Practice of Surgery" observes: "Until recently the pathological anatomy and interpretation of the functional or pathological phenomena of tetanus were involved in great obscurity. It has been regarded as essentially and primarily a blood-disease, the nervous system being secondarily affected. This view was revived by Rose, and it is that to which Billroth strongly inclines. But no evidence has hitherto been adduced in proof of any blood-disease. And although the essential nature of tetanus may yet require further elucidation, and especially by a more extensive assortment of post-mortem examinations, the original researches of Mr. Lockhart Clarke have brought to light a series of structural changes in the spinal cord, which are of the highest importance.

"In six cases these changes may be summarily stated as follows; and, apparently, in the following order of succession:

"No morbid deposit nor any appreciable alteration of structure takes place in the walls of the bloodvessels of the cord; but the arteries are frequently dilated at short intervals, and surrounded, sometimes to a depth of double their diameter, by granular and other exudations, beyond and amongst which the nerve-tissue, to a greater or less extent, has undergone certain changes. In the first stage, softening of this tissue; secondarily, granular disintegration, the tissue becoming softer or semi-fluid, and more transparent. Ultimately the reduction of the tissue to a fluid state. This fluid, at first, is more or less granular, holding in suspension the fragments and particles of the disintegrated substances, but in many places it is perfectly pellucid. The bloodvessels also share in the disintegration of the part, and commingle with their enshathing granular exudation. Thus a general softening and disintegration of structure has taken place.

"A fluid area of considerable size may occur at a single spot, and extend to the surrounding tissue; or at several spots, which advancing, coalesce between irregular masses of the tissue, or portions, separating, are left as islets in the fluid. This process of destruction affects the grey substance of the cord; perhaps its central part. (Fig. 105.)

"The same lesions of the cord are found in paralysis. But they are commonly unaccompanied by *spasm* during life. Tetanus, therefore, probably differs only from that disease in being associated with a morbid condition or injury of some of the peripheral nerves. There is generally marked congestion or inflammation of some nerve connected with, and leading from, a wound

Treatment.—A late eminent lecturer on this subject, as affecting the horse, was wont to observe, in producing a stable-door key,

that has occasioned the disease; the vascularity, which may be very intense, often extending up the neurilemma to a considerable distance. In the case of a man who died from tetanus, caused by a spike-wound of the thigh, corresponding with the anterior crural nerve to the extent of some inches, that portion of this nerve was distinctly inflamed; and my house-surgeon, Mr. Hamilton, had promptly extracted two pieces of clothing, which relieved the symptoms. 'It would therefore appear,' observes Mr. Lockhart Clarke, 'that this condition or injury of the peripheral nerves is the determining cause of the phenomena, and that the spasms of tetanus depend on the conjoint operation of two separate causes.'

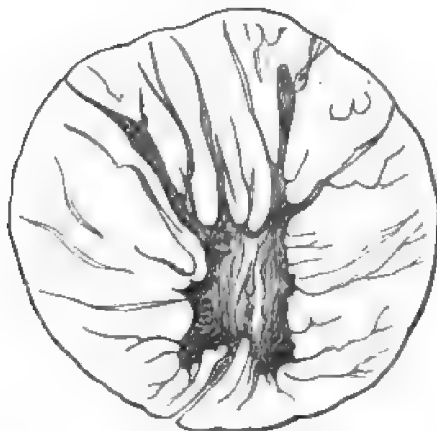


Fig. 105.—Section of spinal cord from tetanic subject.—*Gant.*

"First, on an abnormally excitable state of the *grey nerve-tissue of the cord*, induced by the hyperæmic and morbid state of its bloodvessels, with the exudations and disintegrations resulting therefrom. This state of the cord may be either an extension of a similar state along the injured nerves from the periphery, or may result from reflex action on its bloodvessels excited by those nerves. Secondly, the spasms depend on the persistent irritation of the *peripheral nerves*, by which the exalted excitability of the cord was induced.

"In so-called *idiopathic tetanus*, arising from exposure to cold and damp, it is probable that the morbid condition of the bloodvessels of the cord results from changes in the state of the peripheral nerves, which may act through reflex action or otherwise.

"Associated with these essential changes of structural condition in tetanus, others, which are apparently incidental, may be noticed. According to Rokitsansky's observations, in cases of some days' duration, a development of young connective tissue takes place in the spinal cord, as if tetanus had resulted

that that was the best measure we could adopt in this disease, and the same meaning he intended to convey is equally applicable to cattle. Perfect quietude, moderate warmth, and subdued light should always be enforced in the treatment of tetanus. The person the animal is most accustomed to is the fittest attendant; the susceptibility to excitement is so intense, that the presence of a stranger, rough handling, or loud and harsh words, will generally induce violent spasmodic seizures, and hasten an agonizing death.

With regard to constitutional remedies, numerous drugs have been advocated, amongst which may be mentioned digitalis, belladonna, opium, curara, and hydrocyanic acid, the latter taking perhaps the lead. Antiphlogistics, alteratives, alkalies and stimulants have also been tried, but at present I am of opinion that Fleming's tincture of aconite stands pre-eminent. Dose, 10-15 minims every two or three hours. An aperient at the onset is, if its administration is possible, very advisable; but it should be borne in mind that an attempt to give a draught to a tetanic animal is, as a rule, creative of that alarm and severe spasms at all times to be avoided. Here, then, is the benefit of aconite. If the patient is able to drink, the drug may be dropped in a little thin gruel or water, without impregnating it with any objectionable taste. When the jaws are locked, and fluids cannot with safety be poured between the teeth and cheek, the same quantity may be given in an enema.

from inflammation of the cord—spinal myelitis; or a marked vascularity of the membranes of the cord and engorgement of the veins may be found within the vertebral canal. In a case of strangulated femoral hernia, for which I operated, all went on favourably for a week, and the incision had nearly healed, when suddenly the most violent tetanus set in, beginning with lock-jaw, proceeding to appalling opisthotonus, and terminating fatally on the fourth day, by which time the wound had re-opened and become gangrenous. I carefully examined the cerebro-spinal axis throughout its whole extent. The intra-spinal veins were gorged with blood, but not those of the cord itself. The intestines have been found much inflamed in several cases; and in two, a yellow, waxy fluid, of a peculiar offensive odour, covered their internal surface. The pharynx and œsophagus may be much contracted, and contain a viscid reddish mucus. The muscles are usually rigid, and sometimes ruptured; but sometimes there is no rigidity. The rise of temperature in tetanus has been attributed to the muscular contractions, as the source of increased heat; but while the experimental observations of Leyden and A. Fick, with regard to dogs, might seem to bear this interpretation, tetanus, in the human species, may be unattended with any rise of temperature, even when the disease is most acute."

Counter-irritation to the spine is at times attended (chiefly in protracted cases) with benefit.

"The *condition* of a wound, at the time of tetanus, seems to have little relation to the disease. Thus, in one case, recorded by Hennen, cicatrization was completed on the same day that life terminated; and Dr. Elliotson observes that the disease has sometimes declined and ceased, although the wound daily grew worse."
—*Gant*.

In the lower animals, my own experience differs from the above. If tetanus is caused by a wound, this should at the same time be carefully attended to. It should be thoroughly examined, to see whether any foreign or irritating matter is present; if there is, it must be at once removed. When the wound is very painful, sedative poultices afford great relief; otherwise dressing with lunar caustic, and afterwards inducing healthy suppuration, is the treatment I recommend. A tendency to gangrene may be checked by carbolic acid lotions or charcoal poultices. In traumatic tetanus, when the wound assumes a healthy condition, the constitutional symptoms usually improve with it.

The diet should be nourishing, easy of deglutition and digestion, as milk, linseed-tea, gruel, and such like. These may be given in the form of enemata if necessary.

EPILEPSY.

This disease, so common in dogs, is of rare occurrence in cattle. As the term denotes, it is a sudden seizure, or falling, accompanied by coma and convulsions.

Predisposing Causes.—Hereditary disposition, congenital malformation, general debility.

Exciting Causes.—Suppression of natural secretions or evacuations, sudden fear or excitement, rapid exertion in obese condition, over-exertion after feeding, long travel, intense heat, forcing stock into high condition, particularly young animals, sudden changes of diet from poor to rich quality.

Symptoms.—Youatt observes: "There are few symptoms to indicate the approach of the fit, except, perhaps, a little dulness or heaviness, which precedes many other diseases, or which might be

merely accidental, or the result of very trifling indisposition. All at once the beast begins to stagger—he falls; sometimes he utters the most frightful bellowings; at other times he makes no noise, but every limb is convulsed; the heaving at the flanks is particularly violent; the force with which the abdominal muscles act would scarcely be credited unless seen; the jaws are either firmly clenched, or there is grinding of the teeth, and a frothy fluid is plentifully discharged from the mouth, mixed with portions of the food, which seem to have been prepared for rumination. The faces and the urine flow involuntarily. Sometimes these symptoms do not continue more than a few seconds; at other times the fit lasts several minutes, and then the convulsions become less violent, they gradually cease, and the beast gets up, looks about him, seems to be unconscious of what has happened; at length he joins the herd, and begins to graze as before."

Treatment.—Our first business should be to, if possible, ascertain and remove the cause giving rise to the fit.

Buckets of cold water may, in the first instance, be dashed over the head and face. Immediately the fit is over a full saline aperient should be administered, with an ounce of carbonate of ammonia.

Bleeding, as a rule, is unnecessary and injudicious.

When coma succeeds the attack, strong ammonia should be applied to the nostrils, and counter-irritation to the back of the head, which should be raised.

The diet, after recovery, must be regulated according to the cause; if it has been previously too rich and excessive it must be altered and moderated; if the reverse, a more generous and nutritious one is indicated.

APOPLEXY.

Definition.—"A disease essentially characterized by the sudden loss, more or less complete, of volition, perception, sensation, and motion, depending on sudden pressure upon the brain (the tissue of which may be morbid), originating within the cranium."—*Aitken*.

"Apoplexy is of two kinds: 1st. That arising from degeneration

of the cerebral vessels, with rupture of them, and extravasation of blood upon or within the substance of the brain ; and 2nd. That in which congestion of the cerebral vessels—not of themselves necessarily diseased—is the primary condition ; this, when excessive, resulting in rupture and extravasation."—*Williams*.

Cattle are very prone to this affection, particularly those in high or plethoric condition. It is more generally observed in the summer months—heat, doubtless, having much to do in its production.

Cause, effect, and result may be summed up as follows: Determination of blood to the head, congestion of the brain, ruptured bloodvessel (if not relieved), and death.

Symptoms.—The animal is taken suddenly, as in the human subject ; staggers, falls, or partially, with the muzzle in the ground ; the eyes are protruded, the breathing is stertorous and loud, and the pulse slow. In the cases of three fat bullocks I was requested to attend, I found two on their knees with their head thrust into a corner of the yard and the horns broken off ; the third was lying down. Each was unconscious. They recovered under bleeding largely and aperients. The attack was attributable to greedily feeding on new grass.

Treatment.—Blood should be abstracted at once, and as soon as signs of returning consciousness take place, a smart dose of aperient medicine should be administered. After recovery it is advisable to keep the animal on low diet for a few days. Where the coma is protracted, ammonia may be advantageously applied to the nostrils, and counter-irritation to the back of the head.

"Should the animal recover consciousness, and reaction take place, recovery may be anticipated ; the attack, however, will leave some degree of dulness and stupor, and the breathing will be accelerated, showing that the vascular system has not had time to recover its tone. The bleeding should be followed up with a powerful purgative, and the tincture of aconite given in twenty-drop doses, and repeated at intervals of twelve hours.

"A peculiar form of congestive blood disease is known to the old writers on veterinary medicine, and to country people generally, as *bluin*. The symptoms of this affection do not materially differ from those described above, but the disease seems to be centred in the cellular membrane and smaller bloodvessels supplying the

skin. The skin about the head, eyes, neck, and chest is puffed up to a most extraordinary degree, sometimes involving the hinder extremities. Bleeding, in almost all cases, gives immediate relief, but this can seldom be effected from the jugular, from the excessive swelling. In these cases a sharp pen-knife should be taken and plunged into the interior of the nose, where a tolerable amount of blood may be procured. A sharp purgative should follow this depletion."—*Dobson*.

PHRENITIS.

Phrenitis, or acute inflammation of the brain, is not frequently met with in cattle practice as an idiopathic affection. It is usually consequent on injuries to the head, heat, indigestion, poisoning, plethora, over-driving, excessive lactation, and the like.

Causes.—In addition to those just alluded to, "there are many pathological conditions of the brain which give rise to symptoms of frenzy, such as tumours, some non-cognizable morbid poisons, uræmic poisoning, rabies, the irritation of melanotic deposits, etc."—*Williams*.

Symptoms.—The disease is usually ushered in with stupor, disinclination to move—a wild expression of countenance, and hurried breathing. These symptoms are quickly succeeded by furious delirium. The animal rushes about and at everything in the most frantic manner. Mischief and destruction seem predominant, and woe betide the obstructive. The wild, haggard expression increases, and as he gallops about, staggers and falls; he bellows loudly; the pulse when it can safely be felt is rapid, but full.

"There is even in health a peculiar formation of the eye of the ox, or a sensibility of the retina to certain colours, which makes the beast dislike a brilliant red object; under this disease it raises him to the highest pitch of fury.

"As, however, the previous oppression and stupidity were much less in the ox than in the horse, so is the succeeding violence increased; not even a rabid ox is a more fearful animal, and it is somewhat more difficult to distinguish between these two diseases in the ox than in the horse. In the early stage of

phrenitis, although there may be lowness or oppression, there is nothing like apoplexy or want of consciousness. Besides, with all his fury, there is more method in the madness of the rabid than the phrenitic ox. The latter will run at everything which presents itself, but it is a sudden impulse; the former will, as it were, plot mischief, and will endeavour to lure his victims within his reach. A much greater quantity of foam will also be discharged from the mouth of the rabid than the phrenitic ox."—*Youatt*.

Mr. Dundas refers to the malady as a form of chorea, but the post-mortem appearances satisfactorily indicate that the results of the cerebral irritation are congestions and inflammatory changes. The disease is due to the prevailing practice in different parts of Scotland of giving "burnt ales" to cows in the neighbourhood of distilleries. The ale is given by steeping straw into it, and the animals will also drink it freely. They often sleep soundly after such a beverage, and sometimes symptoms of intoxication are manifest. The symptoms are as follows: The head is turned singularly to the side, and is slightly elevated. The pupils are widely dilated, and the eyes have a remarkably wild appearance. On approaching the animals they wink rapidly and tremble. There is marked heat of head, horns, and ears. When pressed with the finger in the axilla they fall instantly, and when pulled by the head they incline to turn over. The pulse is about 70 or 80 per minute. Mr. Robert Morris has informed me that the symptoms of cerebral excitement are very great, and if the animals live on, chronic disease, due to exudations, etc., in the brain, become confirmed. One cow, the case of which was reported by Mr. Dundas, manifested symptoms of serious illness as the period of calving approached. Symptoms of delirium and interference with the muscular apparatus existed, and the animal had knocked off her horns in falling over in the stall and dashing about. After death all the organs are found healthy except the nervous centres, and both the brain and its membranes are found highly congested. This congestion often extends into the spinal canal, and the pia mater over both the brain and cord is the seat of red spots. The redness is either ramified, or is obviously due to blood extravasation. Clots of blood have been found in the lateral ventricles, and around the spinal marrow in the cervical regions. There is evidently softening of the brain substance as a direct result of this condition.

Etiology.—Professor Williams observes : “ It is generally held by writers upon veterinary medicine, that the malady arises from an overloaded and impacted condition of the stomach, that the cerebral symptoms are purely reflex or sympathetic, and that no actual disease of the brain or its meninges is present. These assertions are not supported by the results of investigation into the morbid anatomy of the malady, further than that the stomach has been generally found filled with food. Now, if engorgement of the stomach were the cause of the train of symptoms seen in this malady, then coma, delirium, or paralysis would be general in the majority of cases of engorgement, seen in the routine of general practice, but this is not the case. Numerous instances of engorgement, impaction, even to rupture of the stomach, constantly come under the notice of the practitioner, but signs of any brain affection scarcely ever occur. We must then look to something more than mere impaction as the cause, and I think this will be found in the *nature* of the food.

“ In Scotland it has been called ‘grass staggers,’ from the fact that it occurs when the animal is on green food ; but ordinary green food does not induce it.

“ I have very carefully noted every case which has fallen under my care for some years, and I find that grass, more particularly rye-grass, when it has commenced to ripen, or when it has been cut, and allowed to heat and ferment before being used, is a fruitful source of this disease. I find that my observations are borne out by those of Professor Dick and others, and that not only horses and cattle are liable to the disease from this cause, but sheep, and especially lambs.

“ Mr. Brydon, V.S., Traquair, in a letter to Professor Dick, says ‘that lambs are often destroyed by eating the tops of rye-grass ; and that he has found the tops of rye-grass two or three inches in length in their stomachs, causing inflammation.’ Professor Dick again says, ‘From what has been stated it will appear that, when rye-grass begins to ripen, a change should be made in the food by placing the animals on other pasture. The grass should be cut before it has quite ripened, as it will be found in that state innocuous.’ He then refers to a statement made by White of Exeter, in White’s ‘Farriery,’ that the disease occurred in one farm in South Wales, from hay made the previous year (1800), and concludes that ‘it

seems more than probable the hay had been over-ripe when made, and that the process of withering had not destroyed the irritating or noxious, or perhaps narcotic, quality of the over-ripe grasses.'—

'*Veterinary Papers,*' by Professor Dick.

"I quite agree with Professor Dick that the disease is due to some peculiar narcotic principle that is developed in the grass at this time, or which may be developed by the process of heating and fermentation, when cut at a more early stage of its growth; for everyday experience proves to us that food, even rye-grass included, has no effect in producing symptoms of cerebral disturbance when used in its ordinary condition, and that it is only when in a transition stage, as it were, between grass and hay, that it seems to possess toxic qualities.

"After careful observation I have arrived at the conclusion that the seat of this disease is in the brain, the spinal cord, and their meninges; that, owing to the quality of the food, a degree of narcotism is first produced, speedily succeeded by congestion and other changes to be described in the morbid anatomy, and that owing to this derangement of the great nervous centres, paralysis of the digestive apparatus is the result, and the stomach becomes sometimes engorged, from the fact that the animal continues to feed when the digestive as well as other functions are in abeyance.

"This disease seems to have first attracted notice in 1787, the summer of which was hot and dry. It raged in the south-west of England and Wales in 1800 and 1819, the summers of which were also hot and dry, prevailing most commonly amongst horses at grass in low, wet pastures, where the grass was rank. It was supposed to arise from their eating ragwort, or stagger-wort (*Senecio Jacobaea*)—a plant supposed to contain a poisonous principle—or some other poisonous herb; but of this there is no absolute proof. We have, however, sufficient evidence to prove that it originates when animals eat rye-grass in the condition described.

"Mr. Gamgee says the disease may arise from gastric derangement, brought about by eating wheat, or even oats and bran, in large quantities. My experience convinces me that this is not the case, and that mere over-loading is more apt to produce rupture, tympanitis, inflammation of the bowels or feet, or intestinal apoplexy.

Morbid Anatomy.—"From various dissections, very carefully made,

it is found that impaction of the stomach is but an occasional complication. In many cases some degree of congestion of the villous-coat has been present, and this appearance led Blaine to conclude that the disease was a specific form of gastritis; but this is not an invariable lesion, and is most probably as much induced by the action of medicinal agents as by food. The stomach may be quite empty; sometimes it contains some amount of food, and at other times it is impacted; there is always a congested condition of the lungs, as is the case in death by coma. The brain and its membranes are invariably congested; the former, after removal, seems to be in a swollen condition; the dura mater seems stretched, and the convolutions appear broader and flatter than natural, as if they had been pressed against the cranial walls. The vessels of the pia mater are injected and tortuous, and that membrane itself is easily lacerable, and may be stripped from the surface of the convolutions without tearing the cortical substance, which of itself looks darker than is natural. On cutting into the brain both grey and white matters are studded here and there with red points. The plexus choroides is large, highly injected, sometimes covered with a thin film of exudation, and the lateral ventricles are filled with fluid.

"In the spinal form of the disease, namely that characterized by paralysis of the hind extremities, the congestion and effusion are generally limited to the spinal cord and its membranes in the dorso-lumbar region; the arachnoid space is filled with serosity of a reddish colour; the pia mater is congested, and the cord itself in a red softened condition."

Treatment.—Having firmly secured the head, blood should be abstracted from the jugular vein, followed by the administration of active cathartic medicine.

Sulphate of Magnesia	14 ounces.
Jalap	4 ounces.
Croton Seeds Pulv.	1 drachm.
Calomel	1 drachm.

In 3 pints of warm water.

In the acute stage of the disease, cold water continually applied, or ice, to the head is serviceable. The hydrate of chloral has also been used with good effects. Amongst other cases recorded of its successful administration, Mr. J. Cammack, M.R.C.V.S., Cape Town, South Africa, mentions the two following:—

"1. 'Mad cow,' shorthorn cow, about six months in calf. Has been taken from grass and placed with others in a straw-yard. Approaching her, she runs away with a startled aspect, then walks round intruders threateningly; has charged two or three persons; bellows considerably. Give 1 ounce every twelve hours, being in low condition; clothe and tie her up. There is visible alteration at once; gets well. There is reason to believe this case depended on indigestion; for, some months afterwards, on her being fed on barley-straw, the symptoms, preceded by constipation, were again observed, and were removed after the use of doses of oil and linseed decoctions.

"2. An aged cow has had fits for three hours. Presents the appearance of strychnine poisoning, which owner thinks has probably taken place. Give, per rectum, 2 ounces in water; animal becomes calm, and I am enabled to give oil, per orem."

In extreme collapse from the exhaustion of nerve force in protracted cases, the administration of stimulants is indicated, of which the most suitable is ammonia. It may be also necessary to apply counter-irritation to the poll. The diet should be laxative, digestible, and unstimulating, while protection from heat, overdriving, and the milk-forcing system are important matters for attention.

VERTIGO.

This disease, which is commonly known as stomach or grass staggers, or fardel-bound, is one to which cattle are very subject.

Causes.—Stimulating food, especially after poverty, overloaded stomach, indigestion, etc. Vertigo at times occurs in connection with incipient brain disease.

Symptoms.—Extreme drowsiness and disinclination to move; the head and ears are dropped; the eyes are staring and vacant; the teeth are grated, and the animal moans and grunts; sometimes the tongue is protruded and the breathing difficult; the secretions are more or less suspended, and in cows particularly the milk. As the disease proceeds, abdominal pain is manifested, and the rumen becomes tympanitic. The eyes assume a more vacant expression; the animal staggers about; the pulse is more indistinct, and at last the sufferer falls down convulsed, and death,

unless relief is afforded, speedily takes place; occasionally the brain symptoms are acute, and frenzy is exhibited. Obstinate constipation is invariably present.

Treatment.—This consists in removal of the cause; a healthy state of the digestive organs must be maintained. An active cathartic should be at once administered, as 1 pound of Epsom salts, 2 ounces of jalap, and 1 ounce of ginger in 2 pints of warm ale; or from 20 to 30 drops of croton oil well blended with 1 quart of linseed oil. Enemas should also be frequently used. After a free action of the bowels has been established, the administration of diffusible stimulants is called for: 1 to 2 ounces of arom. spts. ammon. twice or three times a day in 1 pint of linseed tea, or from 4 to 6 ounces of brandy with the same directions, or 1 ounce of carbonate of ammonia may be given every three or four hours in ale.

The food should be of a sloppy nature for some time after recovery, unless undue relaxation of the bowels is present.

HYDROCEPHALUS.

Hydrocephalus, or dropsy of the brain, is very commonly met with in new-born calves (see "Diseases of the Fœtus"); indeed, it is a condition which often prevents birth, except at the sacrifice of the offspring. The disease is easily recognised by the unusually large and disproportionate volume of the head, while occasionally it happens that there is no roof at all to the latter, owing to the pressure of the fluid preventing the bones coming in contact. This effusion may vary from a few ounces to as many pints. Rainard gives the quantity found in the skull of a hydrocephalic calf sent to him at two and a quarter litres, and Lombardin records the following measurements of the cranium of a six-months' calf thus affected: height over 14 inches, length $8\frac{1}{2}$, breadth $4\frac{1}{2}$. What size this latter would have obtained at the full term of pregnancy one can only surmise. The abortion was in this case good fortune to the cow.

" Though this alteration, or rather distension, of the brain is of so serious a character, and though it must have begun at an early period of uterine life, yet it does not appear to have much influence

on the development of the foetus, as this is usually found to be full-grown, its skin well covered with hair and well-formed everywhere except in the head. Exceptional cases occur, however, in which development is arrested; as in some mentioned by Lequoc, of hydrocephalic calves, in which the limbs were atrophied and the bones of these cartilaginous.

"If intra-uterine existence can be maintained by the hydrocephalic foetus until the period of parturition, it generally perishes during birth or soon after—usually after one or two respirations. In some exceptional cases, however, such creatures have lived to the eighth day after birth, and, as St. Cyr remarks, they might survive even longer if the dropsy is not very extensive. In the most favourable cases, nevertheless, there is little profit to be expected from keeping such animals alive, as they are ordinarily weak and thrive badly; they can rarely stand, and they refuse the teat, being usually in a semi-comatose state; if the tumour chances to be pressed upon, the young creature becomes unconscious and lies in convulsions."—*Fleming*.

HYDATIDS.

The subject of parasites as affecting the lower animals has lately occupied considerable attention with pathologists. The disease commonly known as *sturdy* or *turnside* in sheep is due to the presence of a parasite or hydatid on the brain, and cattle are subject to the same thing. (See Chapter, Internal Parasites.)

Symptoms.—These are thus described by Youatt. "First, some degree of fever comes on. She perhaps scarcely eats—rumination is suspended—the muzzle is dry—the ears and roots of the horns hot—the breathing laborious, and the hair rough. It is fever without any evident local determination. Perhaps she is bled and physicked; but on the following day, the thing begins to speak for itself; she turns round and round, and always in the same direction: it is pressure upon the brain; and remembering what he sees in his sheep, the farmer at once despairs, for it is plain enough that no operation can relieve such an animal from the hydatid.

"Let him not, however, despair. It is evidently pressure on the

brain; but is the pressure of the hydatid the only one that can affect the brain, or produce this peculiar motion? Would not effusion of blood, or of any fluid, on some circumscribed portion of the brain, produce the same effect? There may have been a somewhat too great determination of blood to the head, and some little vessel may have given way. It is worth trying for a day or two at least, and the cow will not be much the worse for slaughter in that time. She should be bled again, and that copiously; and a stronger dose of physic should be given. In some instances—perhaps we may be justified in saying in the majority of cases—the animal will do well. A somewhat spare diet at the time, and for a while afterwards, will be plainly indicated. Success will not, however, attend every case; and in some countries, much oftener than in Great Britain, cattle have hydatids on the brain.

"It is a disease, however, peculiar to young cattle. It seldom attacks any beast after he is a year and a half old. Bartholin, an old writer, states that in 1661 a great many beasts perished from a species of frenzy; and that, when they were examined, vesicular worms were found in the brain. In Switzerland, attacks of the hydatid are said not to be infrequent among cattle; and as soon as the beasts begin their circular walk, they are caught and struck somewhat hardly on the head and between the horns with a hammer, and the operator judges of the situation of the hydatid by the shrinking of the animal and the hollowness of the sound.

"Now, we apprehend that enough has been said of the hollow between the plates of the frontals, and occasional inflammation of the lining membrane, and collections of pus about the roots of the horns, to satisfy the reader with regard to the real nature of this supposed hydatid. The shrinking will point out the spot at which the membrane is inflamed, and the *suspension* of the hollow sound will indicate where the pus is collected. There the operator makes an opening into the skull, and a fluid escapes, which he conceives to be the contents of the hydatid.

"Veterinary writers in those countries where the hydatid in cattle is known, very properly remark that it may be discovered in young stock in the same manner that it is in sheep—by the softening of the bone at a particular part; because the frontal sinuses are not fully developed in young beasts. The hydatid may then be punctured with an awl in the common way, or better got at with

the trephine; but for our own parts, the chance of *permanent* cure is so slight in *sheep*, that we should be inclined to recommend that the *young cattle* thus affected should be immediately destroyed."

Modern surgery has found success by puncture with a trochar and canula. After its insertion the former is withdrawn, the latter remaining. A syringe is then applied to the canula, and the contents of the cyst are drawn out.

PARALYSIS.

Paralysis may be general or partial—*i.e.*, the whole muscular system may be involved, or certain branches of it.

Causes.—Paralysis, generally, is due to pressure on the brain or spinal cord; or it may arise from injury, disease, or pressure of the nerve itself.

When it arises from the brain, the whole of the body is usually affected. If only one side of the brain is injured, then the reverse side of the body is most frequently paralyzed (hemiplegia).

When the spinal cord is injured, the paralysis is confined to those parts behind the seat of injury.

Paralysis also follows certain conditions of the body, independent of actual disease of the brain or other nerve-centres, as in chorea, old age, and general debility.

Paralysis of the hind-quarters is the form commonly seen in cattle practice, and, when not due to spinal injury, is usually associated with parturient apoplexy, or pregnancy.

Paralysis of motion may be due to the following conditions: "1. Lesion of a nerve in some part of its course destroys its power of transmitting that force which is expressed by a contraction of the muscle into which the nerve is distributed. 2. A lesion of some part of those central parts of the nervous system whence the nerve takes its origin, or with which it may be connected directly or indirectly."—*Dr. R. B. Todd.*

"And, as a correlative statement, it may be written that whatever interferes materially with the conducting power of nerve-fibre, or the generating power of nerve-vesicle, will constitute a paralyzing lesion. Poisoning of the nervous matter will operate in this way. *Chloroform, ether, opium, the poison of lead and of mercury,*

applied directly to the nerve-fibre of a living animal, suspends its power of transmitting the nervous force so long as the influence of the poison lasts.

"Poisons formed or retained in the living body operate in the same way, such as the retained *urinary* and *biliary* principles, the poisons of rheumatism, etc.

"Whatever, in short, impairs the natural structure of the nerve matter, such as *inflammation*, *atrophy*, *condensation*, *softening*, *solution of continuity*, either by simply cutting the trunk of a nerve, or by the dilquescence of the nerve fibres as a result of disease, such as *white softening*, a *sanguineous* or *serous effusion*, *pressure on a nerve* or a *nervous centre*, are causes which will produce more or less complete paralysis. Of this there is abundant proof, *e.g.*, the inclusion of a nerve in a ligature, compression of a nerve by a tumour, a depressed piece of bone in fracture of the skull, or an apoplectic clot on the exterior of the brain."—*Aitken*.

The lesions which give rise to *hemiplegia* or *one-sidedness* are :

"1. Softening; a clot or abscess in the *corpus striatum*, or *optic thalamus*, or in the immediate vicinity of those parts, and which produces pressure upon these central ganglia or centres of volition. Unless pressure be produced, or the fibres otherwise interfered with, paralysis does not result.

"2. Exudations, which are the result of inflammatory or other diseased states of the membranes of the brain, which, as they increase and cause pressure on the surface, transmit the effects of the pressure downwards to the *corpus striatum* and *optic thalamus*, and thus cause paralysis.

"3. Morbid, which affect or destroy fibres of deeper-seated parts, such as the *crura cerebri*, or of the *cerebellum* in its *crura* (because a connection exists between the hemispheres of the *cerebellum* and the fibres of the pyramids in the *pons varolii*), cause paralysis.

"4. The slow accession of paralysis following symptoms of irritation indicates a gradual morbid change, such as from exudations slowly taking place.

"5. An important feature in paralysis is due to the condition of the muscles, as to whether they are rigid or relaxed.

"6. Rigidity, whether supervening or occurring simultaneously with the paralysis, indicates irritative disease within the cranium.

"7. In cases where the rigid condition of the muscles does not come on till after a long period of paralysis, and after the muscles are perhaps wasted from atrophy, such a condition indicates loss of substance in the brain, and that the cicatrix is undergoing contraction.

"Four different conditions of the muscles are to be observed in cases of paralysis:

"1. A condition little different from that of health, but less firm, less excitable by the galvanic stimulus, when the paralyzing lesion is not of an irritative kind.

"2. Complete relaxation of the muscles, characterized by softening, imperfect nourishment, and rapid wasting—so rapid that in a few days the size of the limb experiences a marked diminution. Such muscles scarcely, if at all, respond to the galvanic stimulus.

"3. Contraction of the muscles, with rigidity and wasting (the flexors being always more rigid than the extensors); a condition which is due to a chronic shortening of the muscles themselves, and generally associated with a form of muscular atrophy.

"4. Nutrition not impaired, constant firmness and rigidity, incomplete paralysis, increased susceptibility to galvanic stimulus.

"The practical inferences to be drawn from these conditions are of great value in treatment. Thus, early rigidity indicates local bleeding or counter-irritation, while complete relaxation is against antiphlogistic treatment."—*Aitken*.

Treatment.—In the treatment of paralysis it is necessary that we should first ascertain the cause. If, for instance, it arises from injury to the brain from a depressed portion of cranium, an operation (in the case of a valuable beast) is at once indicated for the removal of that pressure. As in like manner for spinal cord or nerve-pressure, a distended bladder is to be immediately relieved. Debility points out a course of restoration to vigour by liberal diet, exercise, and tonics, and the removal of other causes giving rise to such condition. In old age, when the nerve-force is as a natural result weak, no treatment beyond attention to the secretory and excretory functions is of much service.

The medicinal agent most effectual in paralysis is undoubtedly strychnia or nux vomica; and this, in chronic cases, may be advantageously combined with iron, quinine, or both. Nux vomica, which is perhaps the most convenient form of administering

strychnia, is prescribed in from 2 to 3 drachms twice daily for a cow, and may be gradually increased after the third or fourth day in proportion to the requirements of the case.*

In rheumatic and muscular paralysis the iodide of potassium, from 2 to 4 drachms three times a day in a bolus, or dissolved in water, has proved useful.

Local measures are often serviceable in paralytic affections, as counter-irritation, setons, and galvanism.

When the animal is able to walk, however imperfectly, it should be daily, but not tiringly, insisted on.

The diet should be nourishing, easy of digestion, and slightly relaxing; the latter is essential—indeed, it will be often found necessary to employ enemas to promote fecal evacuation, owing to the paralysis extending more or less to the intestines.

In all cases of paralysis particular attention should be paid to the bed being dry and the inhalation warm.

When the affection is established in such a manner as to render the animal helpless, the patient should not be allowed to lie too long in one position, otherwise troublesome sores are apt to arise. In cases where they do, fuller's earth, alum and flour—one part of the former to three of the latter—or the oxide of zinc ointment or lotion, are most suitable applications.

In confirmed and chronic paralysis, complete recovery is rarely witnessed, some lingering effect, as twitching or tremor of a part, being observable throughout life. In such instances, undue exposure to cold and damp should be avoided.

CHOREA.

Chorea, St. Vitus's Dance, termed in human medicine "Insanity of the Muscles," is usually in cattle a sequence or associate of other

* It may be well in this work, as in my "Canine Pathology," to observe that in the administration of this drug, extreme care is required, particularly in the increase of the dose and the times at which it is given. When any alteration is made in the quantity, it should be very gradual. The best time for its administration is shortly after the patient has fed, and the hour should always be the same. Neglect in these matters has caused many fatal issues in what might otherwise have been satisfactory cases. It is advisable, also, in leaving the medicine off, to gradually and not suddenly suspend it.

disease. In the cow it very frequently follows parturient apoplexy, when paralysis remaining after recovering from the first-named disease renders the patient unable to rise. Some very marked cases of chorea supervening on this state have come under my observation, in which there was not only clonic spasm of the muscles of the limbs, but also twitchings of the face and body.

In human subjects chorea has been known to occur from sympathy, imitation, and fright; that it is due to perverted nerve-function is doubtless the correct opinion, but the why and wherefore is still a matter of speculation. "We may regard it as a disease dependent on a debilitated state of the system, which does not in any way arise from an inflammatory or hyperæmic state of any part of the great nervous centres or of other organs. Indeed, it is impossible to fix upon any particular organ of the body in which anything like structural lesion exists as a constant feature in cases of chorea. The disease is one of functional disturbance rather than of organic change, and this is borne out by the results of post-mortem examinations; for almost without exception we fail to detect in those cases of chorea which terminate fatally any morbid alterations which, physiologically, could give rise to the phenomena; and in the great majority of cases we find all the viscera in a perfectly healthy condition—at least so far as we are enabled to make out with the means at present at our command. The structures which are obviously affected in chorea are the nerves and muscles. Doubtless a morbid state of both exists; but it seems most probable that the disturbed state of the muscles is excited and maintained by a deranged state of the nerves and nervous centres."—*Dr. Todd.*

Treatment.—To regulate the bowels and urinary organs, subdue nervous irritation, and impart tone to the system. Sulphate of magnesia, jalap and calomel and nitrated water fulfil the first object, the hydrate of chloral, or subcutaneous injection of morphia the second, and strychnia or nux vomica, iron and quinine the last. Strychnia or nux vomica is especially serviceable in chorea, and may be given in the doses prescribed for paralysis. Iodine, turpentine, bromide of potassium, belladonna, calabar bean, and atropia, are the principal agents which have found favour with some authorities.

Local remedies in chorea are sometimes beneficial. I have found setons exceedingly valuable. If the convulsive movements are

confined to the hind parts, the seton should be inserted obliquely on either side of the loins; if general, at the back of the head and loins. Counter irritation along the spine is also serviceable.

When abatement of the twitchings with returning strength is observed, a favourable issue may be expected; but so long as any nervous affection remains the medical treatment should be persisted in, and always *gradually* suspended.

When the animal is able to rise, and can manage to walk a short distance, a *little* exercise each day will be beneficial. The fresh air acts as a tonic, new scenery diverts the mind, and exercise encourages the natural habits and functions of the creature.

The diet throughout must be nourishing and digestible. Usually cows feed pretty well under chorea, unless the case is an extreme one; then the forcible administration of food may be necessary.

Occasionally rheumatism becomes associated with chorea, and then the heart is frequently complicated. (See "Heart Diseases.") In such cases a cure is hopeless, but under judicious treatment and careful nursing the rheumatic and chorea symptoms may be considerably modified, and the animal's life thereby prolonged if desired—a questionable matter with a cow.

HYSTERIA.

As in the human subject, hysteria may be regarded as a nervous disorder. The disease as yet appears to have been rarely recognised in veterinary practice. Probably the same causes which operate in its production in the higher creation, are present more or less in the bovine species. Thus it may be associated with the parturient state, be due to a morbid condition of the cerebral structures, or referred to "a morbidly excessive excitability of the whole nervous system, which renders it liable to be thrown into disorder by causes insufficient materially to disturb its action in health."—*Aitken*. Disorder of the digestive organs may also favour an attack of hysteria. Young animals, more especially those which are approaching or have recently arrived at maturity, are more susceptible to the affection than aged ones.

The following case, recorded in the *Veterinary Journal*, September, 1880, occurred in my own practice:

On the evening of June 23, after a terrific thunderstorm, I was summoned to attend a cow at Mrs. Mander's, the Mount, Tettenthal Wood, which was supposed to be suffering from milk fever (parturient apoplexy). On my arrival I found the animal, a Welsh one, which had given birth to her second calf two days previously, lying, and presenting the following symptoms: Breathing loud and cooing, and performed with great difficulty, approaching suffocation; eyes wild and bloodshot; pulse more than a hundred beats per minute, and small; ears and horns hot; body perspiring; tremblings, and indications of extreme mental disturbance. Auscultation revealed intense congestion of both lungs, and loud bronchial râle. This was at seven p.m., and I was informed that the patient had been in perfect health, and suckled her calf at five p.m., being immediately afterwards attacked as described, the time at which the thunder and lightning were most marked. An aperient had been given, and I was requested to bleed her, it being thought, as already observed, that she was seized with parturient apoplexy. I, however, pronounced the animal to be suffering from the effects of intense fright, and that probably during rumination: a violent clap of thunder or flash of lightning (which was most vivid) had created immediate suspension of that function, and a portion of the ingesta in its cesophageal ascent for remastication, or in the act of deglutition, had passed down the trachea and given rise to these symptoms of asphyxia, and the louder peculiar noise usually heard in such cases.

Having administered a good dose of oleum lini and half a pint of brandy—no easy task in her violent paroxysms—I had her sides well stimulated with turpentine, and mustard applied along the spine. I had the head suspended somewhat high, swabs placed round the horns and kept well saturated with cold water.

Intestinal and urinary functions being suspended, enemas were given and the catheter passed; the milk, which had also partially disappeared, was frequently drawn away.

Several times the patient rose to her feet, and, bellowing, blundered about indiscriminately, and now and then furiously, apparently perfectly unconscious of her actions, or at all events without being able to control them.

Three hours after first seeing her, tetanus set in, the jaws being firmly locked and the incisors pressed into the pad. Frequently

she manifested a desire for water, and thrust her nose into it, but was unable to swallow. Her symptoms of violence, with this alarming concomitant (tetanus), increasing, I injected subcutaneously one drachm of solution of atropia, and twenty-four minims of solution of morphia (Hewlett's preparation). The effect was speedily most marked, the patient becoming quiet and appearing in a calm slumber, which lasted about three or four hours. Early next morning I found the jaws capable of being opened nearly two inches, and other general symptoms of improvement. There was, however, still an expression of bewilderment or stupefaction on the countenance. She had been up once, and I was informed had attempted to jump the hurdle placed before the doorway. As the day progressed the abnormal symptoms disappeared; she regained complete use of her jaws; small doses of aromatic spts. ammon. were given at intervals, and towards evening, except a still somewhat wild appearance, she was pretty nearly herself again.

By the following morning complete recovery had taken place.

Remarks.—The animal being at all times a remarkably excitable and nervous beast, I have no doubt that this idiocrasy, added to the condition of her nervous system after so recently calving, rendered her more susceptible to the influence of fright, and gave rise to the state described. No external indication of lightning stroke could be discovered, though such an accident was not at all improbable, as the doors and windows of the building (a small one adjoining the paddock) were wide open, and the electric fluid was seen about it.

It is worthy of remark, that at Perton Grove, a short distance from the Mount, at precisely the same time, and on the same evening, two young heifers in the farmyard were seized in like manner, tetanus supervening in each case, and they died the following morning (no treatment was adopted). A post-mortem examination revealed that they had been struck by lightning.

CHAPTER XIX.

DISEASES OF THE EYE AND APPENDAGES.

Ophthalmia.—Cataract.—Amaurosis.—Worm in the Eye.—Fungus Hæmatodes.—Corneal Dermatoma.—Laceration of the Iris and Dislocation of the Lens.—Enlargement of the Haw.—Inversion of the Eyelids.—Inversion of the Eyelashes.—Warts on the Eyelids.

OPHTHALMIA.

OPHTHALMIA may assume three forms—simple or catarrhal, purulent and contagious, or strumous. In cattle, the first named is most frequently met with, while from time to time we have reports of the purulent and contagious form breaking out in herds.

Simple or catarrhal ophthalmia consists in inflammation of the mucous membrane lining the eyelids and covering the ball. It may be acute or chronic. The inflammatory action is generally superficial in the first form, while in the latter deeper structures are involved.

Ophthalmia may be sympathetic with other diseases, particularly of the digestive organs, and at times there is observed an hereditary tendency to it, as in scrofulous diathesis—hence the strumous form mentioned—whilst not unfrequently it may occur from rheumatic affections.

Causes.—Simple or catarrhal ophthalmia usually arises from mechanical injuries, as blows, hedgethorn pricks or scratches; the presence of foreign bodies, as hay-seeds, dust, grit, flies, etc.; irritating vapours, damp and cold—the latter in transit per train, and particularly when easterly winds prevail.

Symptoms.—Simple ophthalmia commences with intolerance of light, deflux of tears, and repeated closing of the eyelids: the eyeball has a somewhat sunken appearance, due to protrusion of the haw and swollen condition of the eyelids. If the latter are

separated, the conjunctival membrane will be found highly injected, and the white of the eye bloodshot; considerable pain is also manifested at the exposure or touch. Constitutional disturbance is indicated by an accelerated pulse, frequently a dry nose, with suspended rumination and appetite. In milch-cows the lacteal secretion is more or less diminished in quantity, and the animal exhibits a disinclination to associate with its companions.

If at this stage the inflammatory action is not checked, it rapidly extends, deeper seated structures become involved, and the vision dangerously impaired. The cornea is traversed with engorged blood-vessels, the pupillary opening blocked by an opaque mass of exuded lymph; and quickly upon this there is ulceration of the cornea, followed by fungoid granulations.

Treatment.—In the first instance a careful examination should be made of the eye by gently separating the lids with the thumb and forefinger, and if any foreign body be present, its removal is at once indicated; in case it is imbedded in the mucous membrane it may be necessary to use a needle or forceps for its extraction. The chief cause being removed, the inflammatory action will often of itself subside, but should it continue to exist, warm fomentations must be used. It is also essential that exposure to light and draughts should for several days be avoided. A saline aperient will assist in abating the constitutional disturbance, and facilitate the speedier cure of the local inflammation. If the disease does not yield to these simple measures and the inflammatory action increases, adjacent bleeding will be found beneficial, the blood being abstracted from the vein underneath the eye. Sedative applications are also soothing and useful; an effusion of poppy-heads is easily prepared and answers the purpose well. The diet should be laxative and unstimulating.

Purulent and contagious ophthalmia frequently assumes an epidemic form. The inflammatory action is exceedingly acute, attended with violent pain, and speedily runs its course. The discharge is thick and purulent, adhering to the eyelashes, and lying *en masse* on the face. The eyelids are considerably swollen, and with great difficulty separated. As the disease proceeds, the cornea and deeper structures of the eye become involved, followed by extensive sloughing, excessive suffering, and ultimate destruction of vision. Generally both eyes are affected, and throughout the

disease the constitutional fever and prostration is very marked. With regard to remedial measures, an active purgative should be administered, and subsequently stimulants and mineral and vegetable tonics, as ammonia, sulphate of iron, sulphuric acid, and bark, and as agents for subduing pain, opium, or the subcutaneous injection of morphia. Local applications may consist of mild, stimulating and astringent solutions, as alum, nitrate of silver, or sulphate of zinc, while sloughing and ulceration require the use of lunar caustic and carbolized oil. Excessive local irritation and pain may be subdued by narcotic fomentations, as warm watery effusions of opium or poppy-heads.

Specific or constitutional ophthalmia is a far more serious complaint than either of the preceding forms. The symptoms are at the time of attack more sudden, aggravated and rapid; occasionally they subside of themselves, but frequently to return with greater violence, each one leaving the organ weaker, until blindness ensues. The opacity of the cornea becomes dense, and mapped with distended bloodvessels. The iris is also involved in the inflammatory process, being of a deep reddish-brown, or dark amber tint. As the disease advances, the intolerance of light becomes less manifest, the pupil is contracted considerably, and is to a great extent immovable to the stimulus of light. The lachrymal secretion is throughout abundant, being of an irritant and scalding nature, and in the advanced stage purulent. This form of ophthalmia is also remarkable for its metastasis, or change of seat, first one eye being affected, and then, when apparently well, the other is seized, and again reversed, showing probably a rheumatic tendency, though by some authorities it has been regarded as "gouty."

Treatment.—Unfortunately this is seldom satisfactory, and may be regarded as more palliative than curative. In the early stage the same local remedies prescribed for the former type may be adopted, but when the disease is more advanced stronger measures are necessary. A smart blister should be applied at the root of each, or a seton inserted, nitrate of silver lotion, 12 grains to 1 ounce applied to the eye; calomel blown in is at times serviceable. The margin of the eyelids should also be smeared with simple ointment to prevent adhesion.

With regard to medicinal treatment, small doses of nitrate of potash and colchicum, 4 drachms of the former and 1 of the latter,

are not unfrequently beneficial. Tonics are also indicated, of which I give sulphate of iron the preference, while a continued course of iodide of potassium, particularly in strumous indications, has met with success. Protection of the eyes during treatment from the light and cold is also essential. Diet as in the former.

An epizootic form of ophthalmia, usually prevalent in autumn, has been observed of late years. It chiefly attacks young stock.

Symptoms.—These are to a great extent similar to those of simple ophthalmia, but with this difference, that the cornea has a peculiarly pearly appearance, and as the disease proceeds it becomes more prominent, standing out like a pea. Ulceration speedily follows this condition, and the sight becomes permanently lost.

Treatment.—This consists in subdued light, blisters, or setons in the poll, or at the root of the ears, zinc or nitrate of silver lotion, aperient medicine, and laxative diet.

CATARACT.

As in other animals and in the human species, cataract may assume one of three forms, viz., *lenticular*, *capsular*, and *capsulo-lenticular*. It is lenticular when there is opacity of the crystalline lens, capsular when the opacity is confined to the capsule, and capsulo-lenticular when both lens and capsule are involved.

Cataract in cattle is frequently the result of ophthalmia, and its existence being manifest, preparation for slaughter would be advisable.

AMAUROSIS.

Amaurosis, termed "gutta serena" or "glass eye," is also occasionally met with in cattle. Not being so perceptible to the animal's owner as cataract, from the natural brilliancy of the organ being preserved, a brief notice of its causes and symptoms will perhaps not be unserviceable to the reader. The disease is consequent on a disordered condition of the retina, optic nerve, or brain. This disordered condition may proceed from external violence, as blows or falls on the head, producing immediate

paralysis, or giving rise to inflammatory action; extravasation of blood, the formation of tumour, and ultimate suspension of nerve-force.

Extreme debility, either from disease, hæmorrhage, prolonged lactation or anæmia, may also be associated with amaurosis.

Symptoms.—The defect in vision may be gradual or sudden. Obstructions are not seen until the animal is close upon or touches them. The gait is peculiarly diagnostic of sight affection. An uncertain *feeling* action is observed in locomotion. The creature relies to a great extent upon the sense of smell, and snuffs the air as he moves about.

Eventually the function of sight becomes totally lost. The eye is clear (unnaturally so) and bright, hence the Arabic term "*gutta serena*," *clear drops*. No irritability in the organ is observed, except occasionally at the commencement of the disease, but, on the contrary, the brightest light is of no effect. The pupil is dilated, and the eye has a more or less vacant expression. One or both eyes may be affected, according to the seat and extent of injury, or from sympathy, which is exercised to a great degree in eye affections, and in amaurotic ones both are generally involved.

WORM IN THE EYE.

This peculiar affection is usually confined to horses, and with but few exceptions has only been witnessed in India and Canada—in the former chiefly occurring in low, humid situations where fogs are prevalent, or the water is stagnant, and it has been noted to be especially common after an unusually wet season; while in Canada it is prevalent in the cold months, and more so during the continuance of easterly winds.

Symptoms.—Conjunctivitis, weeping, closed and swollen eyelids, indistinct patches of effusion in the cornea, and intolerance of light. On very close examination of the eye, a small white worm, similar to a portion of cotton, may be observed floating in the aqueous humour, alternately rising and sinking.

Treatment.—"Puncturing the cornea at its upper and outer margin, and allowing the parasite to escape with the aqueous humour. This spot is selected for the operation, because the

cornea is here least dense; and the upper instead of the lower margin, because the aqueous humour, which gradually re-forms, will be less likely to again escape whilst the wound is healing, than if the incision had been made at the lower part."—*Percival*.

Professor Williams recommends a sharp-pointed scalpel for the operation, "which," he remarks, "should be pushed flatwise through the cornea, as near to its junction with the sclerotica as possible, making an oblique opening under the cornea: the sides of the wound will then fall into close contact with each other, and be in a favourable position for uniting by the first intention; whereas, if the puncture be made directly through the substance of the cornea, whether its direction be perpendicular or horizontal, the sides of the wound will be pushed apart when the chamber begins to fill, and the healing process retarded.

"Two kinds of worm have been found in the eye—*Filaria oculi*, and *Strongylus*—and the same kind of worms are also found in the intestines, the areolar tissue of the loins—supposed to produce the disease called *rummirree*—and in the bloodvessels. The filariæ are small white parasites, about an inch in length, of an attenuated and cylindrical form, having a mouth and anus, also an intestinal canal suspended in a cavity of the body, and, like other round worms, the sexes are distinct.

"These worms find their way into the animal's body along with the water he drinks, either as fully developed parasites or as ova (eggs). Both the parasites and their eggs are abundantly found in the stagnant waters of India."

FUNGUS HÆMATODES.

Fungus of the eye-ball is a frequent, troublesome and unsightly disease among cattle. It consists of a soft, dark-coloured malignant tumour, situated within the orbit. In its early stage it appears as a small red body towards the posterior part of the eye. As the body increases, it gradually involves the eye, which, in pushing forward, it displaces to one side, at other times forcing it out as though the organ were about to burst; becoming larger and larger, it extends to the orbital bones, and the whole site becomes a bleeding cancerous mass; frequently the eyelids are distended

and swollen. It is obvious the disease must be of an exceedingly painful character.

Causes.—Repeated attacks of ophthalmia, disease of the optic nerve, scrofulous diathesis.

Treatment.—This is seldom successful unless adopted in the earliest stage of the malady. Entire removal by excision is the only reliable measure, and in nearly every instance it will be found necessary to include the eye-ball. The actual cautery should afterwards be freely applied to the excised surface to arrest the hæmorrhage and destroy any remnant of the disease. The patient, after the operation, should be placed in a dark box or other building, on account of the remaining organ becoming inflamed from sympathy. A saline aperient is advisable before and after the operation, and a somewhat low and laxative diet should follow.

CORNEAL DERMATOMA.

Professors Robertson and Walley record in the *Veterinary Journal*, March and June, 1877, interesting cases of that condition known as "hairy tumour," "trichosis bulbi," or "corneal dermatoma," considered by Wharton Jones analogous to moles on the skin. Professor Robertson observes: "The case to which I would now draw attention exists in a short-horned bull-calf, six months old—in every other respect perfect, well-formed, and healthy. The abnormal condition was observed by the owner shortly after birth. The condition of the eye I have carefully examined, having been requested to visit the animal and advise regarding the course to be adopted with '*a calf supposed to have a double under-eyelid.*' The most cursory examination of the eye reveals the presence of a considerable number of hairs similar in appearance to those of the eyelashes, springing from the cornea and sclerotic, and projecting between the eyelids—or rather, I should say, as they are kept constantly wet with tears, hanging over the margin of the lower one. More carefully looked at, it is evident that these hairs are implanted in what looks exceedingly like a *mole*—a portion of tissue of a dark brown colour, which, judging from the examination made of a portion removed, is really and truly skin. This new or abnormal tissue is slightly elevated above the level of the sclerotica and cornea upon which it is placed; the latter, being less encroached

upon, is nearly circular in outline, about three-eighths of an inch in diameter and covered with conjunctiva. The only disturbance which this tumour seems to cause is an abundant flow of tears."

Professor Walley says: "I have only met with two specimens of this abnormality. One of these specimens was given to me by Mr. Lancelot Barker, of Skelton, then a student at this college. The other I obtained at the Edinburgh abattoir. The latter I exhibited to the members of the Scottish Metropolitan Association, and I have much pleasure in forwarding a very beautiful pencil sketch of it—made at the time by Mr. Vaughan—for publication

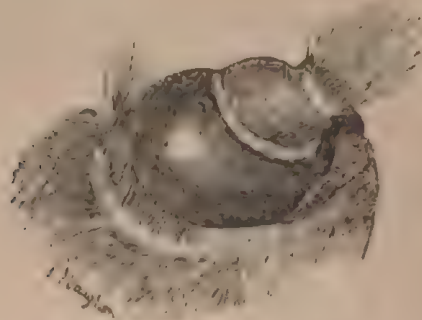


Fig. 106.—Corneal Dermatoma.

(Fig. 106). Clinically, these growths are not of much consequence; they are more interesting as showing the close relation which exists between the conjunctival and corneal structures and the skin."

LACERATION OF THE IRIS AND DISLOCATION OF THE LENS.

"I also forward for publication rough pencil sketches of two other uncommon ophthalmic lesions. One (Fig. 107) is a representation of laceration of the iris, with adhesion of its free borders, the adherent portions dividing the pupil into two nearly equal parts. The sketch is taken from the eye of a cow, in which animal the lesion was bi-lateral. As illustrating the well-known saying that

'rare cases seldom occur singly,' I may mention the fact that I detected the same lesion (at about the same time) in the eye of a horse which was under the care of my colleague, Mr. Baird, for lameness.

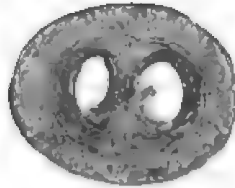


Fig. 107.—Iris of a Cow : Laceration of free border and adhesion of ruptured portions to each other. The two light and somewhat oval spots represent the portion of the pupil uncovered by the torn iris.

"Both these cases, I am of opinion, had originated either in direct injury, or from adhesion of the free borders of the iris, as the result of the inflammation.

"The other sketch (Fig. 108) illustrates a case of dislocation of

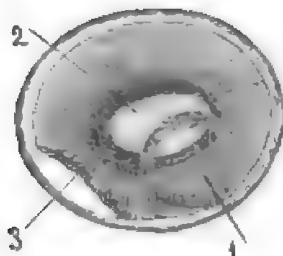


Fig. 108.—Eye of a Cow : 1, Displacement of lens into the anterior chamber ; 2, Pupil opaque and occluded by thickened hyaloid membrane ; 3, Rent in attached border of iris.

the lens, which I recently brought before the notice of the members of the Scottish Metropolitan Association, and the particulars of which were published in the *Veterinary Journal*."

ENLARGEMENT OF THE HAW.

This useful provision of nature, the haw (*membrana nictitans*), is a fold of membrane placed at the inner corner of the eye, for the purpose of removing irritant matters from the surface of the globe. In the ox it is well developed, owing to his inability to use any other portion of his frame for the same purpose. From its frequent prominence over the eyeball in other diseases, it has through ignorance been removed as the exciting cause of the affection; a cruel and generally needless operation, only demanded as a *dernier ressort*. When enlarged from disease or injury, it presents an exceedingly inflamed appearance, is very sensitive to touch, causes the animal considerable pain, and gives rise to profuse lachrymation. The eyelids are often swollen, and the vision more or less obstructed.

Treatment.—The general treatment consists in scarifying and warm fomentations. Astringent lotions are useful, and in many cases sufficient. Should the enlargement persist, it may be gradually reduced with the scalpel, or scissors, and caustic; and it is only when these measures fail we are justified in removing the whole substance.

INVERSION OF THE EYELIDS.

Inversion of the eyelids (*entropium*) is observed in the bovine species, more especially in young animals; indeed, not unfrequently it is congenital. From the margin of the inverted lid turning against the eye, much irritation is caused by the conjoined friction of it and the lashes.

The inversion may be partial or total; i.e., one portion of the eyelid margin may be turned in, or the whole; or one or both lids over each eye may be so affected.

Symptoms.—Associated with the inversion there is continual lachrymation, intolerance of light, extreme sensibility on touch, injection of the eyelids, and ultimately thickening of the conjunctiva, which finally becomes dry and cuticular.

Treatment.—This consists in removing, by excision, a portion of the relaxed structure; and, if possible, to promote healing by the

first intention. The portion removed should be of an elliptical shape, and as near as possible to the margin of the eyelid.

INVERSION OF THE EYELASHES.

Inversion of the eyelashes (*trichiasis*) is when the lashes grow in towards the eyeball, as in the former condition. Such a state gives rise to irritation and excessive lachrymation. It may be relieved sometimes by plucking the lashes out with forceps; otherwise the operation described for entropium may be resorted to.

Districhiasis is the reverse of trichiasis.

WARTS ON THE EYELIDS.

Warts on the external surface of the eyelids, or their margin, are not uncommon in cattle. They are more frequently diffused and conglomerated than isolated and pedunculated.

Treatment.—In the former, the application of lunar caustic or strong acetic acid is the best application. When pedunculated, they may be removed by excision or ligature, and the wound afterwards occasionally causticed.

CHAPTER XX.

DISEASES OF THE EAR.

Otitis.—Scurfy Ears.—Serous Abscess.—Fungoid Growths.—Deaf Mute.

DISEASES of the ear are not so frequently met with in the ox as in other domesticated animals. This, to a great extent, arises from the protecting influences of the hair, and in some instances the direction of the horns. Contusions from the brutality of drovers, perhaps, happen more frequently than any other injuries; and these may result in swelling, abscess, and deafness.

Otitis, or inflammation of the internal ear, is indicated by the animal holding its head on one side, and suspended movement of the organ. Around its base it is hot and tender, and within it may be observed to be red and inflamed, with occasionally a discharge, more or less offensive and irritating, and in special cases tinged with blood. Movement of the jaws increases the pain, hence rumination is more or less suspended.

Treatment.—External warm fomentations, astringent and sedative injections, and laxative medicine, are the measures to be prescribed. In protracted cases, with persistent discharge, the injection of a solution of nitrate of silver (10 grains to 1 ounce), or solution of chlorinated soda (40 grains to 1 ounce), will be found serviceable; and counter-irritation around the root may also be adopted.

SCURFY EARS.

A beast is sometimes affected with a scurfy itchy condition of the ears. This may either be associated with mange, or result from an overheated, plethoric habit of body.

Treatment.—When due to the former, the measures prescribed for that complaint are to be adopted. If arising from plethora, an aperient, followed by sulphur and nitrate of potash, and a spare unstimulating diet, usually removes the affection.

SEROUS ABSCESS.

This is usually a collection of fluid between the cartilage and integument on the inside of the ear, giving the organ a dropsical or pouched appearance. It is generally the result of external violence or blows.

Treatment.—The sac should be freely incised with a lance, and its contents evacuated. The wound will quickly heal, and the ear assume its natural condition. If it should again fill, suppurative action, by inserting a small pledget of tow smeared with stimulating ointment, should be established, and the part treated as a common wound.

FUNGOID GROWTHS.

Fungoid growths, or granulations, occasionally form on the ear, generally at the base.

Excision, followed by the application of caustic, and astringents, forms the best treatment.

DEAF-MUTE.

“An interesting case of the occurrence of deaf-muteness in a cow is recorded in the *Veterinary Review*, edited by Dr. Haubner. The animal has been for twelve years in the possession of her present owner, who bought her as a calf when only three weeks old. No amount of noise appears to attract her attention in the slightest degree. When left alone in the stall, or when her calf is taken away from her; or again, when feeding-time is due, she goes through exactly the same movements as the other cows that are lowing, stretching out head and neck, and opening the mouth wide, but no distinct sound is uttered. She is extremely watchful of everything that goes on around her, and an unusually acute sense of vision appears to make amends in some degree for the defects in other senses. Nothing abnormal can be found, on examination, about the ears or throat. She has been the mother of eight calves, but nothing is known as to whether any of these were similarly affected, as all of them were slaughtered very shortly after birth.”
—*Veterinary Journal*, January, 1879.

CHAPTER XXI.

DISEASES OF THE SKIN.

Mange.—*Ringworm.*—*Elephantiasis.*—*Pityriasis.*—*Urticaria.*—*Pemphigus.*
Warts.—*Warbles.*—*Lice.*

MANGE.

THIS unpleasant disease, though not so frequently met with in cattle as in the horse and dog, is nevertheless far from uncommon. Starved and neglected animals, and more especially those exposed in markets, are usually the subjects of mange. Mange is due to the presence of a parasite, and two species are recognised in bovine scabies—psoroptic and symbiotic. To which species, however, it may belong, it can only be propagated by the migration, directly or indirectly, of the parasite giving rise to it. Filth and neglect favour parasitic development, but do not of themselves produce the disease.

Youatt observes:* "The causes are various; they are occasionally as opposite as it is possible for them to be. Too luxuriant food will produce it; it will more certainly follow starvation. The skin sympathizes with the overtaxed powers of digestion in the one case, and with the general debility of the frame in the other: and nothing is so certain of bringing on the worst kind of it as the sudden change from comparative starvation to luxuriant food. Want of cleanliness, though highly censurable, has been oftener accused as the cause of mange than it deserves; but to nothing can it more frequently be traced than to contagion."

Fleming,† concerning scabies in the bovine species, says: "The scabies of the ox is not of great moment in a sanitary point of view, and is due to two parasites—the psoroptes, dermatocoptes

* "Cattle: Their Breeds, Management, and Diseases."

† "Veterinary Sanitary Science and Police."

or dermatodectes, and the symbiotes or dermatophagus—each producing its own symptoms.

"The sarcoptic form of the disease is rare in this animal; and nothing appears to be known of the bovine sarcoptes. The disease chiefly affects the head and neck.

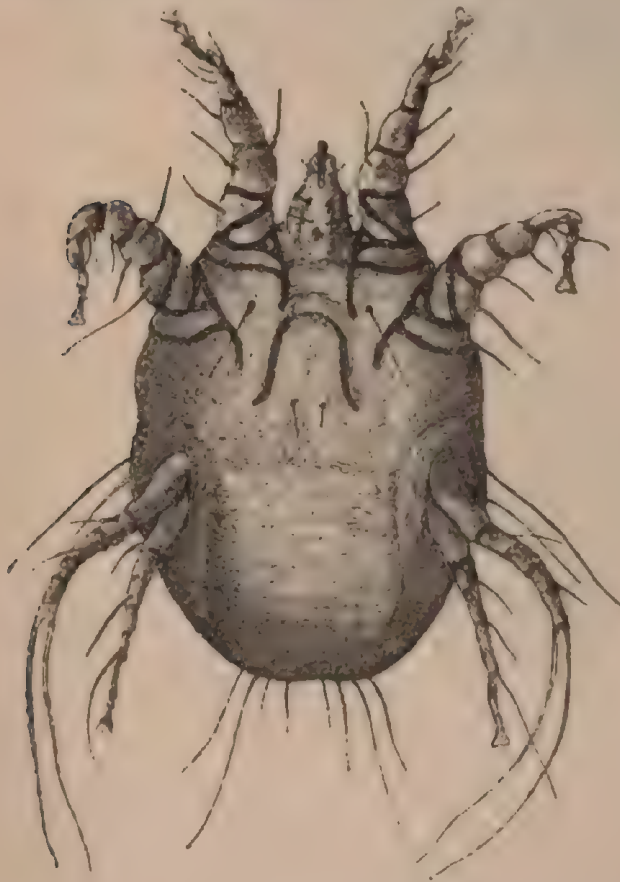


Fig. 109.—*Dermatodectes Bovia*.—*Gerlach*.

"*Symptoms.* 1. *Psoroptic Scabies*.—The symptoms of this form are similar to those of the horse. At first intense pruritis, soon followed by the appearance of vesico-papulæ; these are generally first observed about the withers and root of the tail, and

soon extend to the sides of the neck, head, back, loins, shoulders, sides of the trunk, and eventually the whole body, except the limbs. The hair falls off, the skin becomes thickened and hard, it corrugates, and cracks and fissures appear in it. At the same time, the continuous and severe itching causes the animal to paw and kick, rub itself against the wall or anything it can reach, and to lick the skin with its rasp-like tongue. From all this arise wounds and abrasions, and the exudation from the skin forms crusts with the broken-up epidermis, among which the parasites revel and propagate.*

"Symbiotic Scabies.—In this form of bovine scabies we have a

* Gerlach, in his work published 1857, describes the bovine psoroptes, which he had recognised in crusts sent to him for examination; but he had not seen the disease.

In 1860, Müller, of Berlin, published (in Gurlt and Hertwig's Magazine) some observations on the scabies he had studied in a herd of oxen in the district of Inowraclaw, and which had prevailed for several consecutive years. This affection always showed itself towards the end of autumn, when the cattle begin to be housed for the winter; reached its worst stage in February; and gradually diminished as the spring set in, and the animals were employed in farm-work; until, when the summer arrived, it had quite disappeared. It always commenced at the root of the tail and sides of the neck; soon reached the head and upper part of the body, as well as the shoulders and sides; when at its worst, the entire body was involved, with the exception of the limbs. The animals rubbed and licked themselves until the skin was marked with bleeding patches; these became covered with pellicles, and the integument itself gradually thickened; the hair was shed; and when the disease was severe the creatures became cachectic, and the more aged among them died. In the spring, the crusts became detached; new hair appeared, except in patches here and there at the root of the tail and neck; at the same time, the skin grew scurfy about the back of the head and around the base of the horns. At last, Gerlach and Müller were called in to examine the diseased oxen, when they discovered the psoroptes, and satisfied themselves that the parasites were present in summer as well as in winter—although in that season the animals appeared to be perfectly recovered—and that they then clustered in great numbers behind the head and around the root of the horns. Dwelling in warm sheds during the winter appeared, therefore, to favour their development and multiplication.

Röll states that one year, towards the end of the autumn, two white buffaloes—a bull and cow—belonging to the Vienna Zoological Gardens, were sent to the Veterinary Institute of that city. These animals had the sides of the neck and body almost entirely denuded of hair, the skin was covered with scales and small crusts, but there were no thick patches of exudation. Everywhere the skin was moderately hypertrophied, but the pruritis was considerable, especially in the cow. The unaided eye could distinguish the parasites moving about rapidly on the skin; they were also found on the under surface of the crusts.

parasite analogous to that which produces the same variety in the horse; though it is not found in the same regions, being generally located at the base of the tail, where it occasions a somewhat intense pruritis, and where an abundance of epidermic pellicles may be observed.

"The hairs also break and fall off; gradually crusts appear; the skin cracks in circumscribed patches, and in these fissures are discovered numerous acari. Through absolute neglect of cleanliness



Fig. 110.—*Symbiotes Bovia*.—*Gerlach*.

the disease may extend from the tail towards the back, and even as far as the neck, and to the inside of the thighs and udder; though, as a rule, it remains localized for years at the base of the tail and the fossa, in the vicinity of the anus (for which reason Gerlach designated it 'steissrande' of the root of the tail).

"The disease is not very readily transmissible to other bovines; it is therefore of little importance, being almost purely local and individual. Neither does the parasite thrive when transferred to

the other domesticated animals, or to the human species. Transported to the pasterns of a horse, it caused neither eruption nor pruritis.*

RINGWORM (PROPER).

This disease is of frequent occurrence in cattle. It is due to the presence of a minute vegetable parasite or fungus (*Tricophyton tonsurans*, *Malmsten*, or *Achorion Lebertii*).

Ringworm is exceedingly contagious, communicable from man to the lower animals, and *vice versa*.

Causes.—Cold, wet seasons; badly-drained, dirty, and uncomfortable stalls; insufficient and innutritious food; inattention to the cleanliness of the skin, are each conducive to the presence of ringworm.

Symptoms.—The most prominent symptom is the characteristic circular patch, with silver scaly crusts, whilst the presence of the fungus removes any doubt that may exist.

"At first the crust adheres closely, but in time it is detached from the central point by a purulent fluid, and at last only remains attached by its periphery."—*Fleming*.

The hair has a dry, harsh appearance, is exceedingly brittle, and easily detached. As the disease advances, the hair breaks off itself close to the crust, and when the latter is removed, the hairs are exhibited in short, bristle-like pieces, surrounded with the spores of the fungus.

From the animal rubbing itself, the characteristic shape of the diseased patch is sometimes obliterated.

The period of incubation is from eight to fourteen days.

Treatment.—Mild mercurial and iodine ointments are generally effectual in the treatment of ringworm. The following is also a very useful application :

Whale-oil	12 ounces.
Terebinth	4 ounces.
Oil of Tar	1 ounce.
Acetic Acid	1 ounce.

* The treatment of mange in the bovine species is similar to that employed for other animals. Liniments of which tar, creosote, or carbolic acid are the active agents, have been used successfully, and in more advanced cases mercurial preparations. In the majority of cases an ointment composed of sublimed sulphur and whale-oil, of each 8 ounces, oil of tar and mercurial ointment, of each $\frac{1}{2}$ ounce, well blended, will be found an effectual dressing. Diseased animals should be isolated, and cleanliness enforced.

To be applied to the parts after first thoroughly washing the skin with soft-soap and warm water, and repeated, with an interval of two days, until the disease is cured.

But by far the most effectual dressing for ringworm is the nitrate of mercury ointment, 1—4.

Attention to hygiene must be observed, and in the case of debility tonics may be given with advantage.

RINGWORM (HONEYCOMB).

This disease, like the former, is due to the presence of a fungus, the *Achorion Schönleini*, *Favus*, or *Tinea favosa*. The parasite is situated in the hair follicle, external to the layer of epithelium which covers the root of the hair. It has a peculiar mousey odour, or, according to others, that resembling cat's urine.

The causes giving rise to this affection are supposed to be uncleanness, neglect in hygiene, and certain peculiar and humid conditions of the skin. In the ox, however, it is usually contracted from other animals, especially mice.

Symptoms.—The disease is characterized by conglomerated, irregular, yellowish cup-like crusts, which *en masse* somewhat resemble a honeycomb, hence 'Honeycomb Ringworm.'

"These capsules, or *favi*, are more or less numerous, and more or less extensive. At the free surface of the crusts there are often found dry, bristly hairs that appear to pass through the entire thickness of the favous mass, and are easily pulled out. At a later period these hairs are shed from the follicles—not broken off—or sharply cut away close to the crusts, as in *Tinea tonsurans*."—*Fleming*.

In both forms of ringworm more or less pruritis exists.

Treatment.—The same measures as advocated in *Tinea tonsurans*.

ELEPHANTIASIS.

The name of elephantiasis given to this disease is derived from the Greek word *ἑλέφας*, the elephant, and so called from the condition of the skin resembling that of the elephant. It is a disease comparatively unknown in England. One case has, I

believe, occurred in the practice of Mr. Storrar, of Chester; at least, such was my opinion from an inspection of the skin.

According to Erasmus Wilson, "Elephantiasis is a blood disease, probably originating in an animal poison, and manifesting its existence either by the deposition of a peculiar albuminous substance in the skin, mucous membrane, and other surface tissues of the body, or by affecting chiefly the nervous centres and the nerves. This double mode of manifestation of the disease has caused its division into two kinds, *tubercular* and *anæsthetic*; the former being that which is characterized by deposition in the surface membranes of the body, particularly by the skin; the latter, that which is occasioned by deposition in and around the nervous centres and nerves. Both forms are chronic in their course, commencing insidiously, progressing slowly, and lasting for years; sometimes terminating in spontaneous cure, and sometimes in death."

In hot countries this disease or its similitude has been witnessed in the ox by several observers, and Gamgee mentions having seen a specimen in the Bologna Museum which was regarded as one of congenital elephantiasis. (Fig. 111).

He further remarks: "From the descriptions of Cruzel, Gellé, Taiche, and Pradal, it would appear that when attacked with this disease, the skin of the ox becomes dry, hard, thick, and wrinkled. It is hot in some parts, and firmly adherent to the prominences over joints in others. The hairs are dry, and pimples form at the opening of the hair-follicles. The cuticle separates in many directions, and deep fissures soon form, which increase in breadth and depth, and discharge a serous fluid, or even pus; the discharge is always fetid. Scabs form, which render the cutaneous surface very rough, and the hairs drop off. The disease may attack the whole surface of the body, or only one part, such as the head. When the head is principally affected, the eyes are closed and the eyelids deeply cracked, but vision remains unimpaired. The discharge from the eyes causes the hair of the face to fall off; the conjunctiva is red and infiltrated: the lips and margins of the nostrils are thickened and tumefied; the Schneiderian membrane is of a pink colour, and a dense, yellow discharge flows from the nose. The buccal membrane retains its normal appearance, and the outbreathed air is not fetid.

"If the limbs are affected, they become enormously swollen, and

very rigid from the knees and hocks downwards; the animal cannot walk, and obstinately stands or lies, and if it maintains the erect position, it does so until it falls from sheer exhaustion. The skin of the digits is nodulated, and ulcers form, which itch to a certain extent, and which the animal licks constantly. The constitutional symptoms are those of disturbed functions—cows cease



Fig. 111.—Elephantiasis Bovina.—Gamble.

to yield milk, the appetite is capricious, and so on. The disease is always chronic, and lasts several months."

Treatment.—Arsenic, nitric acid, nitro-hydrochloric acid, mercury, antimony, iodide of potassium, iodide of iron, bromide of potassium, *Asclepias gigantea*, *Hydrocotyle Asiatica*, are among the prominent remedies which have found favour with medical men, the two latter especially both internally and externally.

Gamble observes: "Success depends more on judicious diet and cleanliness than the use of medicines. Some recommend occasional bleeding, but the majority are opposed to this practice. Low diet is suggested for the febrile stage, and setons have been inserted in the dewlap. Active purgatives have been strongly recommended, and locally the use of emollients, of healing ointments, etc."

PITYRIASIS.

Pityriasis is a term derived from the Greek word *πύριον*, *bran*—synon., *herpes furfuracens*, branny tetter, dandriff—and consists in a bran-like or scaly desquamation, attended with slight redness of the skin, but without exudation. The disease is chronic and non-contagious, and may attack any region.

Professor Williams observes: "This is a very common disease among horned cattle, particularly young stock, and affects various parts of the body, the neck and shoulders, the rump, sides, etc. It is accompanied by some degree of itchiness, and the scurf often furnishes a habitat for the production and development of vermin.

"The development of pityriasis seems to be due to an ill-furnished condition of the animal body, arising from poor food, and it generally prevails in the winter and early spring months, and disappears spontaneously when the cattle are put into good pastures.

"The treatment must consist of good food, the alleviation of the itchiness, and the destruction of the vermin which become associated with it, by sulphur ointment, or an ointment of stavesacre. If the disease attack an extensive surface, the sulphur is the safer remedy, as the animals lick their skins, and may take more stavesacre into their stomachs than is good for them."

In obstinate cases the nitrate of mercury ointment will be found most efficacious.

URTICARIA.

Urticaria, "nettle-rash," is a disease of very sudden development, and of often equally rapid disappearance.

Causes.—High temperature, stimulating food, plethora, disorder of the nervous and digestive systems.

Symptoms.—Numerous elevations of the skin, attended with incessant itching and slight heat, and subsequently shedding of the hair; but the latter is not invariable.

Treatment.—Saline aperients, and the application of acidulated and sedative lotion to the skin; plain unstimulating diet; cleanliness.

PEMPHIGUS.

Pemphigus, from *πέμφιξ*, a bubble, or blister—synon., *febris bullosa*, bladdery fever, water-blebs. This is a non-contagious skin disease characterized by the evolution of bladders or bubbles of various sizes containing transparent serous fluid, which ultimately becomes acid, puriform, and mixed with blood. All parts of the body are affected. The bubbles form rapidly, and occasionally suddenly disappear. In the majority of cases they burst, and the formation of a brown crust follows, underneath which the skin is red and inflamed. In chronic cases the disease lasts over some months, rendering treatment tedious and difficult.

Pemphigus usually depends on a debilitated condition of the system, and is also associated with gastro-intestinal irritation and old age.

Treatment.—Internally, saline aperients, followed by mineral tonics and alkalies. Externally, puncture of the bubbles, and the application of oxide of zinc.

In chronic cases, medicinally, arsenic is most effectual; and externally, nitrate of silver ointment.

WARTS.

Cattle are frequently affected with warts, chiefly located on the eyelids, ears, lips, and teats. The treatment consists in removal by excision, ligature, cautery or caustic. Youatt records the following singular case: "At uncertain intervals, from six to nine or ten months, a cow suddenly lost flesh, her coat stared, she would scarcely eat, and at length rumination was entirely suspended; then would appear, and nearly all over her, and particularly about the udder and in the mouth and on the eyelids, a thick crop of warts, varying from the size of a millet-seed to twice that bulk. In a fortnight they were gone."

WARBLES.

Warbles consists in small tumours containing the grub deposited by the *Æstrus bovis*—the gad-fly—which attacks cattle in the summer months.

Bracy Clark says : " Of all the European species of this genus, this is the largest, and is not unfrequently seen in country situations in the backs of oxen and cows. They form tumours as large as pullets' eggs on the sides, about the back and loins. With us among the country people they are called warbles, wornils, wormula, and sometimes bots.

" When I first took up the investigation of these animals, I was in considerable perplexity what this species could be, since I possessed the (*Estrus bovis* of Linnæus, agreeing perfectly with the description, and which was a horse bot ; nor had I then seen the writings of Vallisneri or Reaumur, which, as Linnæus had seen and referred to, I did not suppose could have fallen into such an error as to have omitted entirely this remarkable species, or have confounded it with the equi ; but it so proved ; and on obtaining the perfect insect from the back of the cow, the mystery became unravelled ; for I was not certain, indeed apprehended after such authority that the same species inhabited both animals as Linnæus had stated : '*Habitat intra Bœm dorsum, in ventriculo Equorum sæpe ipsis lethalis*' (Lin. Syst. Nat., p. 969). This insect was not known to Linnæus, and, indeed, has been rarely seen ; Vallisneri, after years of labour, procured only one mutilated specimen of it ; and Reaumur, after great pains and expense, only two or three. A mode of obtaining this fly, which succeeded with me perfectly well, I shall now describe, by which I obtained out of three larvæ two perfect flies, one so perfect that it flew away while I was making some experiments in presenting it with different objects ; the other I gave to Thomas Allen, Esq., after drawings had been made from it for the use of the Linnæan Society. One I also fortunately caught of these flies, between Salanche and Bonneville, in Savoy, flying in the road, and settling on some dung where cattle had recently passed ; this specimen, on my return through Germany, I presented to the venerable and worthy Professor Daniel Schreber, of Erlang, the intimate friend and pupil of Linnæus, who till then had not seen it.

" The following is the simple means for obtaining them perfect, which may be not unacceptable to those who for their cabinets or from curiosity may wish to see them :

" During the latter months of the summer, about which time the larvæ are found fully grown, and about to quit their habitations,

which can be known by the superior size of the abscess, and especially the increased diameter of the external opening; such being selected for the experiment, we remove the hairs round the tumour to a considerable distance with a pair of scissors as close to the skin as may be; and a piece of leather, thickly spread with pitch, being provided, through the centre of which a hole is cut about the size of the finger, and into this a small gauze pouch or bag is inserted, hanging out an inch or two from the leather; this plaister with its pouch is then placed upon the skin, to which, from its warmth, which is very considerable, it readily adheres, the pouch being opposite the opening. Whenever the insect makes its way out and falls from the abscess, it is caught by the bag, in which, as it cannot escape, it remains till removed by the person looking after them. The larva thus obtained, as it is full fed, will hardly fail to produce a perfect fly; it is only necessary to put it into a pot with some light loose earth for it to change upon.

"That we may continue the history of these flies with some degree of uniformity, we shall commence its operations with some remarks on the deposition of the eggs, as we have done with the former species. This act appears to be attended with severe suffering or apprehension at least, which makes the cattle run wild and furious, and gad or stray from the pastures; and hence the ancient epithet of gad-fly. When yoked to the plough, the attack of this fly is attended with real danger, since they become perfectly uncontrollable, and will often run directly forwards through the hedges, or whatever obstructs their way. There is provided, on this account, to many ploughs a contrivance immediately to set them at liberty. When the cattle are attacked by this fly it is easily known by the extreme terror and agitation of the whole herd; the unfortunate object of the attack runs bellowing from among them to some distant part of the heath or the nearest water; the tail, from the severity of the pain, is held with a tremulous motion straight from the body, and the head and neck stretched out to the utmost. The rest from fear generally follow to the water, or disperse to different parts of the field.

"And such is the dread and apprehension in the cattle of this fly, that I have seen one of them meet the herd when almost driven home, and turn them back, regardless of the stones, sticks, and noise of their drivers; nor could they be stopped till they reached their accustomed retreat in the water."

Further on Mr. Clark says: "When young the larva is smooth, white, and transparent; as it enlarges it becomes browner; and about the time it is full grown it is totally of a deep brown colour.

"The larva having attained its full growth and size, effects its escape from the abscess by pressing against the external opening, which occasions its enlargement by the points pressed upon being absorbed, and the skin also may give way and extend itself under their impression. When the opening has obtained the size of a small pea, the larva writhes itself through, a ring or segment at a time, till, arriving at the narrower part of its body, it falls out, and tumbles to the ground, and, seeking a convenient retreat, becomes a chrysalis.

"After leaving the abscess, and preceding their change, they contract themselves into a much smaller space, and assume a different figure. They never change or throw off their skin, apparently, but the same serves them through their whole growth, and at length also forms the shell of the chrysalis, as in the other species of this genus.

"If we examine the sac which enclosed the larva beneath the skin, it appears formed of condensed cellular membrane, and is rough on the inside. The pus secreted is mostly of a yellow colour, and sometimes flows from the opening, and dries about the orifice. After the exit of the caterpillar the abscess disappears, and the wound in the skin closes up and is healed in a few days; but although the skin heals up on the exit of the larva, we may remark that the union is not so firm as was the original skin, but is effected by a sort of agglutinating deposit, which afterwards, on the skin being dried and hammered by the tanners, gives way and cracks again in these places, showing the union to have been of a less perfect nature than the original skin; the succedaneous nature of the repair of broken skin has been remarked by late physiologists, and we mention this fact as confirmatory of their doctrine.

"The chrysalis is of a dark-brown colour, and in figure somewhat resembles the half of a walnut-shell, being narrower at one end than the other, and flat on one side, and very rounded and convex on the other. Those which I bred remained in the state of chrysalis from the latter end of June till about the middle of August, when the fly appeared. I have, notwithstanding, observed full-grown larvæ in the backs of cows as late as the ninth month,

or September, which must have produced their flies as late as November or December, or perhaps not till the ensuing summer.

"The larva after being immured in the chrysalis a sufficient time, and its soft members dry and in a degree hardened, bursts from its confinement by forcing open a very remarkable triangular lid or operculum, and makes its way out at the small end.

"The larva at the period of making its way from the back of the beast is weak and tender, and exposed to imminent danger, if on land, of being trod on by the cattle or picked up by birds; if on the water, where the cattle stand during great part of the day at this hot season of the year, it perishes by drowning or becomes the food of fishes.

"It is worthy of remark, that Reaumur has stated that its escape from the back of the beast usually takes place at a very early hour of the morning, at two or three o'clock, or at sunrise; now, if it be so, it is remarkable that in this way much of the danger is avoided, as the animals at this time would most probably be upon dry land, and in a more quiet state than at mid-day, and the birds would not then be present."

"It is not unimportant for me to notice here that the gad-fly is apt occasionally to attack the human being. Dr. Matthews Duncan contributed an interesting paper on this subject to the first volume of the *Edinburgh Veterinary Review*. He refers to the subject as follows: "Travellers have brought us, from remote regions, accounts of bots being found in men, in such numbers in one individual, and in so many cases, as to give the question of the existence of an æstrus hominis in these regions a quite different aspect from what it presents if we confine our attention to Europe. Kirby and Spence,* for example, believe that the Spanish traveller Azara mistook this insect when he said, 'that in South America there is a large brown moth, which deposits its young in a kind of saliva upon the flesh of persons who sleep naked. These introduce themselves under the skin without being perceived, where they occasion swelling, attended by inflammation and violent pain. When the natives discover it, they squeeze out the larva, which usually amount to five or six.' In his edition of the '*Systema Naturæ*, Gmelin says: 'Habitat larva in America australi per sex menses sub cute hominum abdominali, si turbetur, profundius penetrando

* "Introduction to Entomology," p. 72.

periculosa, adeo ut fertur, lethalis; imago muscæ domesticæ magnitudine.' Again, MM. Humboldt and Bonpland, speaking of certain districts of the equatorial regions, make the following remark: 'Aux mosquitos se joignent l'œstrus humanus, qui dépose ses œufs dans la peau de l'homme, et y cause des enflures douloureuses.*' And I believe Latreille represents Humboldt as having seen Indians whose bellies were covered by little tumours, which he believed to result from the presence of bots in that region.† Similar accounts are reported from La Condamine, Barriere, and other travellers in America; and a physician to the King of Cayenne has sent to the French Academy of Sciences an account of the frequent occurrence of bots in men and women there. Further, D'Abreu is reported by Siebold, in his article on parasites, in Wagner's 'Handwörterbuch,' as describing the frequent occurrence of bots in a certain province of Brazil.‡

"These numerous examples of the comparative frequency of this affection in foreign countries, and especially in South America, might be much extended by further quotation from the article in the 'Transactions of the French Entomological Society,' already referred to, as well as from the paper of the Rev. Mr. Hope, in the 'Transactions of the Entomological Society of London.' If they convince us of the real frequency of the disease in these countries, and if we observe the remark of Gmelin on the smallness of the imago, we may be left in hesitation as to the existence of a distinct species in these quarters.

"Although the disease is rare in Europe, yet cases of its occurrence in almost every region of it, from Iceland to Italy, are on record.§ The case which came under my observation, and particulars of which were communicated to the Medico-Chirurgical Society of Edinburgh in 1854,|| was, I believe, the first ever published of its occurrence in Scotland. But then, as now, I felt assured that cases were not so rare as this circumstance might seem to indicate. I was therefore greatly gratified by the perusal of an

* "Essai sur la Géographie des Plantes," p. 136. Paris, 1807, p. 36.

† "Annales de la Société Entomologique de France," tome ii. p. 518.

‡ "Handwörterbuch der Physiologie," ii. Band, p. 635.

§ Besides the papers already noticed, there is said to be a collection of observations in the work of Keferstein on insects injurious to men and animals. Erfurt, 1837.

|| *Monthly Journal of Medical Science*, July, 1854, p. 80.

excellent paper on this disease in the *Edinburgh Medical Journal* for November, 1858, by Dr. Spence of Lerwick, who gives an excellent account of several cases of it occurring in the Shetland Isles, and states his previous announcement of similar observations in his inaugural dissertation presented to the Medical Faculty of the University of Edinburgh in 1848.* The frequency of the disease in this gentleman's district leads us to express a hope that still further observations may be made by him on this interesting subject, and especially that facts may be collected as to the subcutaneous migrations of these animals. It might also be ascertained to what size the larva grows in the human subject, and the careful tending of the mature larva in its subsequent metamorphoses might lead to the decision of the question of the existence of an *æstrus* peculiar to man. At present the circumstances already enumerated, the occurrence of the larvæ in the exposed parts of the body, and in women who are all loosely dressed, and in those much exposed in the habitats of the *æstrus*, lead us to believe that in this country the human insect is merely a stray or misled bovine bot.

"E. C., a girl aged 13, came from Perthshire in September, 1853, to reside in Edinburgh. She had never been in bad health till shortly after leaving the country, when she began to suffer pains which she connected with the bots. She first felt a little lump on the back of the neck, which slowly changed its position in various directions. Then a hole opened over it, and a worm was squeezed out. Some weeks afterwards another similar lump was felt on the right side of the trunk. It also wandered about subcutaneously till a hole opened over it, and it was forcibly rubbed out. A third made its appearance over the spine, high in the chest, then travelled up the neck, when for a time it was lost, and was supposed to reappear on the right side of the neck, where a hole formed over it. Now [on 3rd March], I was fortunate enough to be called, and observed a small, not inflamed, tumour, of the size of a large field-bean, and having an opening on the top as big as a pin-head. Peeping into this hole, I saw one or two black points which rolled about. On squeezing moderately the little lump, there was discharged a living larva, half an inch long, evidently of the *æstrus bovis*, and the same as those previously noticed by the girl. A little dirty yellow

* See *Edinburgh Veterinary Review*, vol. i. p. 400.

juice issued with the animal, containing a few blood globules and pus corpuscles. The girl says that, while in Perthshire herding cows, she was much exposed to the air, and was frequently stung by insects."

LICE.

These troublesome insects are chiefly met with in poverty-stricken and ill-cared-for stock. Their presence materially prevents the well-doing of the animal. The species usually seen are the *Hæmatopinus vituli* (louse of the calf), and *Hæmatopinus eurysternus*, *ani et vulvæ*, observed on the shoulders, anus, and vulva of the cow.

The *Hæmatopinus eurysternus* (Fig. 113) is thus described in Gamgee's "Domestic Animals," abridged from Denny's "Monographia Anoplurorum Britannicæ":

"Chestnut and shining; head, sub-triangular; occiput, rotundate; thorax, transverse, quadrate; abdomen, large, ovate, ashy white; spiraculi, prominent and fascus; length, 1 to 1½. The young are much more agile than the mature insect, and differ in nothing except a want of proportion, the limbs being much thicker as compared with the bulk of the body than when adult.



Fig. 113.—*Hæmatopinus eurysternus* (Louse of Ox).—Gamgee.

"This parasite is very common on oxen, congregating especially on the mane and shoulders, causing considerable irritation and rubbing, with constant loss of hair on those parts.

"*Hæmatopinus vituli* (Fig. 114). Chestnut; head, sub-lyrate; abdomen, long, and sub-cylindrical, ashy white; legs very thick; length, 1 to 1½.

Remarkable as being parasitic on the young, and not on the mature animal, having been found only on the calf, never, so far as I am aware, on the ox."

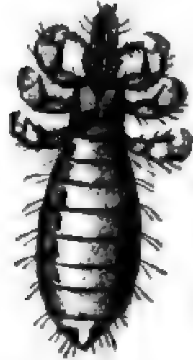


Fig. 114.—*Hæmatopinus vituli* (Louse of Calf).—*Gamgee*.

Treatment.—Strong decoction of tobacco, stavesacre, mercurial compounds, or arsenical preparations have been successfully employed. Dobson says the following formula is recommended as being both *safe* and destructive to the lice:

Stavesacre-seeds	4 ounces.
White Hellebore	1 ounce.

Boiled in a gallon of water until only two quarts remain. Apply with a brush to those parts where the lice are seen.

CHAPTER XXII.

INTERNAL PARASITES (ENTOZOA).

After Cobbold.

THROUGH the kindness of Dr. Cobbold I am enabled to lay before my readers illustrations of those parasites which are found in the ox, and from the works of this eminent helminthologist the present chapter is transcribed. The immense importance of the subject, both to veterinarians and agriculturists, and the value of being thoroughly acquainted with it, must be my excuse for obtaining the information given from the highest authority we possess, and one whose unceasing investigations have conferred an inestimable boon upon the world at large.

PARASITES OF THE OX.

The ox, considered as a supporter or bearer of parasites, is, like all other animals holding a similar relation, technically and very conveniently termed a *host*. As such he is liable to entertain a great variety of entozoa; and he is frequently also the victim of injurious attacks by several species of insects, which are not entozoa in the zoological sense, though some of them are undoubtedly so in the more general acceptance of that term. Certain of these insects are parasitic both in the adult and larval conditions. The ox, moreover, is the bearer of the juvenile stage of development of an important human parasite; and within the tissues of its body—as obtains also in the case of other food-producing ruminants—we may encounter a multitude of those minute parasitic organisms erroneously called “cattle-plague” bodies.

In the first place, let us consider the nature of those parasites which are commonly called *flukes*. These creatures form the group or natural order of Entozoa, termed *Trematoda*, or perforated

worms. We sometimes speak of them as trematodes, or flounders; but they are recognised more frequently as flukes. A fluke signifies, by virtue of the original meaning of the word, anything flat, and the sailors in the North Seas employ the term "flukes" to designate the flattened division of the tail of the whale.

Flukes are very closely connected, structurally, with a non-parasitic order of small creatures commonly inhabiting ponds and ditches, and which are termed Planarians. Some of these last-named creatures, however, dwell in the sea, attaching themselves to rocks and weeds, crawling about after the fashion of leeches, to which animals they bear a very general resemblance. They rarely measure more than two inches in length.

The planarians so nearly approximate to the common liver-fluke in respect of their digestive organs that it is well to understand this part of their structure. They are extremely voracious, being furnished with a complicated stomachal apparatus. Look, for example, at this illustration of *Eurylepta Sanguinolenta* (from



Fig. 115.—A Planarian, showing the Digestive Organs.

Gegenbaur), in which only the alimentary organs are displayed. You perceive a rather large ventrally situated mouth (*a*), leading to a capacious gullet (*b*); whilst from the stomach (*c*) there pass off numerous vessel-like branches, which subsequently divide and subdivide, until at length they spread themselves throughout the entire substance of the body. I particularly wish it to be understood that the planarians and flukes are destitute of any general somatic or body cavity. The organs in question do not lie loosely in a so-called abdominal space, and for this reason some helmin-

thologists speak of these planarians and flukes as belonging to the parenchymatous or non-cavitary series of worms. The distinction is one of no zoological value ; but in relation to the economy of these creatures it is too important to be passed over in silence.

COMMON LIVER FLUKE.

This parasite (*Fasciola hepatica*) is a rare guest of the ox, being far more abundant in the sheep. It varies in size from half to rather more than one inch in length, and is sometimes as much as two-thirds of an inch in breadth. If any proof were wanting as to its affinity with the planarians, it is only necessary to look to the arrangement seen in the digestive organs. The present figure, reduced from one by Blanchard, should be compared with that of the planarian. In this illustration *a* refers to the oral sucker, *b* to

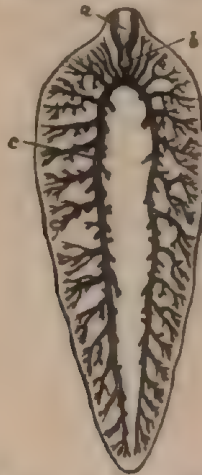


Fig. 116.—Common Fluke.

the bulb of the œsophagus, and *c* to the main digestive tube of one side ; the other internal organs, as well as the external ventral sucker, being unrepresented.

In Dr. Cobbold's work of 1879 he further observes regarding the *Fasciola hepatica* :

"1. The liver fluke, in its sexually-mature state (*Fasciola hepatica*), gives rise to the disease commonly called *rot* ; this affection being also locally termed *coathe* (Dorsetshire, Devon), *iles* (Cornwall), and *bane* (Somersetshire). In France it is known

as the *Cachexie aqueuse*, and more popularly as *pourriture*. In Germany, the epidemic disease is called *Egelseuche*, and in a more limited sense either *die Fäule* or *die Leber-krankheit*.

"2. The *rot* is especially prevalent during the spring of the year, at which time the fluke itself and innumerable multitudes of the free eggs are constantly escaping from the alimentary canal of the bearer. The germs are thus ordinarily transferred to open pasture-grounds along with the fæces of the bearer.

"3. As it has been shown by dissections that the liver of a single sheep (also of an ox—*J. W. H.*) may harbour several hundred flukes, and as, also, a single adult fluke is capable of throwing off several thousand eggs, it is certain that any *rot*-affected flock is capable of distributing millions of fluke germs.

"4. Such flukes as have escaped the host, per anum, do not exhibit active powers of locomotion. Their slight contractile movements, however, serve the purpose of concealing them in the grass, and probably aid in the further expulsion of eggs, which pass from the oviduct in single file.

"5. After the death of the escaped flukes, the further dispersion of the eggs is facilitated by the subsequent decomposition of the parent worm, and also by its disintegration,

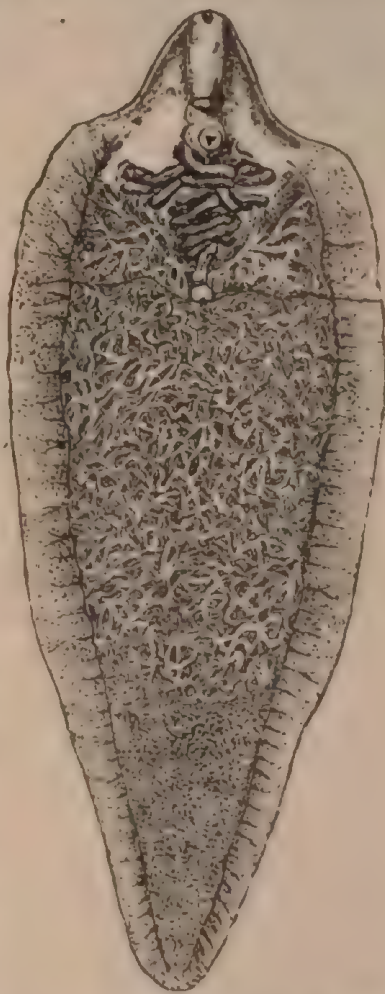


Fig. 117.—*Fasciola Hepatica* (enlarged).
After Blanchard.

partly occasioned by the attacks of insects. It has been calculated that the uterus of a full-grown fluke may contain upwards of forty thousand eggs.

"6. By the agency of winds, rains, insects, the feet of cattle, dogs, rabbits, and other animals, as well as by man himself, the freed ova are dispersed and carried to considerable distances; and thus it is that a considerable proportion of them ultimately find their way into ponds, ditches, canals, pools of all kinds, lakes, and running streams.

"7. At the time of their expulsion, the eggs exhibit a finely segmented condition of the yolk. The egg contents continue to develop, whilst outside the parent's body, the granular matrix finally becoming transformed into a ciliated embryo, which when set free follows the habit of infusorial animalcules in general by swimming rapidly through the water. The escape of the embryo is effected at the anterior pole of the egg-shell, which is furnished with a lid that opens in consequence of the action of prolonged immersion, aided by the vigorous movements of the contained embryo.

"8. The ciliated free-swimming embryo, at the time of its birth, exhibits the figure of an inverted cone, its anterior extremity, which is broad and somewhat flattened, supporting a central proboscis-like papilla. A small pigment spot placed dorsally, and having the form of a cross, is supposed to be a rudimentary organ of vision. After the lapse of a few days the cilia fall off, the embryo then assuming the character of creeping larvæ (*planula*).

"9. Notwithstanding its abridged locomotive powers the non-ciliated larvæ sooner or later gains access to the body of an intermediary bearer, within or upon whose tissues it becomes transformed into a kind of sac or *sporocyst*. In this condition the larva is capable of developing, agamogenetically, other larvæ in its interior. The sporocysts are highly organized, forming *redia*. According to Willemoes-Suhm, the redia of *Distoma lanceolatum* lives on the body of *Planorbis marginata*. This organized nurse, which is about a line in length, is the *Cercaria cystophora* of Wagener. The progeny of this redia consists of armed cercariæ, which after a time quit the nurse to pass an independent existence in the water. According to a recent communication from Professor Leuckart, the cercaria of *Fasciola hepatica* resides in *Limnæa truncetula*.

"10. In the cases of some species of fluke there is reason to believe that before the cercaria gain access to their final or definitive host they re-enter the bodies of the mollusks. This

they accomplish by means of a boring apparatus, and having previously cast off their tails they encyst themselves beneath the surface of the skin. In this new situation they develop into the so-called *pupa*, which is at length passively transferred with the fodder or drink to the digestive organs of the host. In the case of *Fasciola hepatica*, as probably obtains also with many other flukes, I think there can be no doubt that the cercariæ pass directly into the bodies of ruminating animals. The circumstance that flukes of this species have been found beneath the human skin shows how considerable are the boring powers of the armed cercariæ.

"In regard to the possibilities of fluke development that will be best understood by glancing at the constitution of the zoological individual. The sum-total of the products of a single germ may be tabulated as follows:

"ZOOLOGICAL INDIVIDUAL (*Fasciola hepatica*).

- | | | |
|--|---|---------------------|
| "a. Ovum in all stages, | } | First 'biotome.' |
| "b. Ciliated free-swimming embryo, | | |
| "c. Nurse, germ-sac, sporocyst (<i>redia</i>), | } | Second 'biotome.' |
| "d. Active, migrating, tailed larva (<i>Cercaria</i>), | | |
| "e. Encysted, resting larva (<i>pupa</i>), | } | Third
'biotome.' |
| "f. Sexually-mature fluke (<i>fasciola</i>), | | |

"This is a fair representation of the life-phases of the fluke. The life-phases are rarely less numerous or complicated than here indicated, but Pagenstecher's researches tend to prove that under certain climatical conditions the number of larval forms may vary considerably. In other words, the fluke individual does not comprise any definite number of 'zooids,' although the kinds of zooids are limited. I recognise three 'biotomes.' The first includes only one temporary, independent life-phase—this is the ciliated animalcule, which I call a 'protozooid.' The second 'biotome' may comprise only a solitary simple sporocyst, or germ-sac (deutorozooid), but an almost indefinite multiplication of new and independent germ-sacs, as well as other more highly organized 'nurse formations,' may also be developed from the primary sporocyst (secondary and tertiary 'deutorozooid'). The third 'biotome' embraces a large but variable number of 'tritozooid' (*Cercariæ*), an equal number, whatever that may be, of 'tertartozooids' (*pupæ*), and, therefore, also a similar number of 'pemptozooids' (flukes)."

There is another little trematode parasite liable to occur in considerable abundance in the ox, but which, on account of its small size, is frequently overlooked. This is the lancet-shaped fluke. When full grown, this species (*Distoma lanceolatum*) measures rather more than three-eighths of an inch in length, its breadth being somewhat less than two lines. Like most of the flukes, it is a true hermaphrodite, and, as seen in the accompanying figure, also reduced from Blanchard, the transparency of the body readily permits of our recognising the reproductive organs in their natural positions. With the exception of the oral sucker, and the short tube passing from it in a downward direction to form the two simple and blind intestinal passages, all the organs here represented refer to the system in question. The parasite is shown



Fig. 118.—Lancet-shaped Fluke.

(Fig. 118) as if viewed from behind, and therefore, as in the previous figure, the so-called ventral sucker has not been traced. It is a true distome, and, as such, forms a very good type of the family.

THE CONE-SHAPED FLUKE.

This small and rather attractive-looking trematode (*Amphistoma conicum*) dwells in the paunch of cattle. It measures somewhat less than half an inch in length, and scarcely more than one-eighth

of an inch in breadth. The ventral sucker is of remarkable dimensions, and, in place of occupying the upper part of the body, as in ordinary flukes, is removed to the caudal extremity. The accompanying illustration, altered from Blanchard, shows the character well (Fig. 119); and this lateral view of the parasite also permits us to recognise the oral sucker, *a*, the large digestive tube of the right side, *b*; affording likewise a good general outline of the water-vascular system, *c*, whose ultimate ramifications terminate in minute pouches.

To illustrate the leading characteristics of fluke development, nothing can be better than a few good figures of amphistomatous larvæ. Here are some carefully selected and much reduced in size,



Fig. 119.—The Common Amphistome.

from Dr. Pagenstecher's admirable representations of trematode larvæ (Fig. 120). The larger larval form, *A*, represents what is termed a sporocyst, and through its transparent skin we may readily recognise the bulb of the œsophagus, *a*, leading to a globular and rudimentary stomach, marked *b*. In addition to the digestive organs, we may notice in the interior a variable number of loosely floating bodies, *c*; these latter being internal buds, so to speak, destined to be transformed into perfect cercariæ.

The somewhat more highly organized larva or cercaria, *B*, exhibits a pair of eyes, *d*, a ventral sucker, *e*, and a conspicuous tail, *f*; and when the same microscopic creature is viewed laterally,

TOOTHED TAPEWORM.

This entozoon (*Tenia denticulata*) is a small species of its kind, measuring only from eight to sixteen inches in length; realizing, however, a breadth of from one-half to nearly an entire inch. The head is square-shaped, and, as in its congener above described, is possessed of neither hooks nor proboscis. The suckers are large and globular; a more distinctive characteristic being noticeable in the form of the joints or segments, which are twenty times broader than they are long. As in the other bovine tapeworm, the reproductive papillæ are double; one being placed on either side of each division or proglottis—as the joint is more correctly called. Nothing is known respecting the development of this species; and, so far as I am aware, it has never been seen infesting any quadruped except the ox. Its name is derived from the serrated character of the lateral margins of the joints or segments.

BEEF MEASLE.

This parasite (*Cysticercus bovis*), though totally unknown to butchers and fleshers at home, is nevertheless familiar to those persons in India whose duty it is to serve out rations to our troops stationed there. Of this fact we have lately received cumulative proof, more particularly through the sixth annual report of the Sanitary Commissioner with the Government of India, through the Bombay Health Officer's Report for the fourth quarter of 1870, and by the report of Assistant-Surgeon T. R. Lewis "On the Bladder Worms found in Beef and Pork," some account of which appeared in the *Lancet* for December 14, 1872 (p. 860).

The beef measle is a larval cestode, or in other words one of the sexually immature stages of development of a tapeworm which infest the human body (*Tenia mediocanellata*); this mature worm being, as I have repeatedly shown, far more frequent as a human guest than the falsely so-called common tapeworm (*Tenia solium*) derived from eating pork.

If a calf, heifer, or full-grown ox be induced to swallow the ripe and living eggs of the human tapeworm in question, the contents of the ova thus ingested will in course of time become transformed

into measles. Here, for example, is a representation of the hind-quarters of a calf which was one of our experimental animals (Fig. 122). The skin has been removed, in order to expose the muscles of the haunch; these, with one exception, being shown in outline only, as at *a*, *b*, *c*, *d*, *e*. The large central muscle, known as the *vastus externus*, gives a good general view of the arrangement of the measles at the surface.

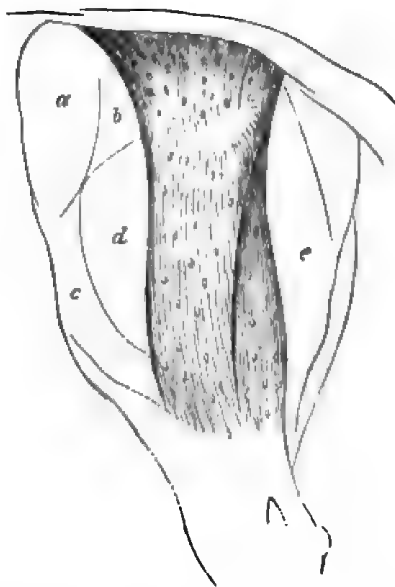


Fig. 122.—Hindquarters of a Calf showing Measles.

At the risk of anticipating some few facts that I must needs make more clear by-and-by, it is, in the meantime, practically important to illustrate the separate peculiarities of the measles side by side. Here, therefore, I have given an enlarged view of one beef measle within its cyst, accompanied by magnified representations of the head of the beef and pork tapeworms respectively. The measle shows a stout, laminated, fibrous envelope, which consists of layers of connective tissue, the latter belonging to the flesh of the host; whilst, in the interior of the capsule, the head and neck of the cysticercus are readily seen through the transparent, bladder-like caudal vesicle. The head is apparently inclosed within

the bladder, but it is in reality outside the vesicle, a portion of which has become depressed to admit the head, after the fashion of an inverted finger of a glove. We term this involution the "*receptaculum capitis*." The caudal vesicle is very thin, but it displays minute specks, which are due to the presence of calcareous corpuscles; these bodies being much more abundant in the substance of the head and neck. The head exhibits four large suckers, equidistantly arranged in pairs at the angles of the square-shaped head; and under favourable circumstances we may always detect the presence of a central depression, which some helminthologists are disposed to regard as a fifth or supplementary sucker. The opaque character of the head and neck is due to the excessive multiplication of the calcareous particles, combined with a greater density of the substance of the parasite in these parts. If these characters be compared with those shown by the two uppermost tapeworm heads, as given in the drawing, a glance is sufficient to determine their correspondency. The upper figure at A, showing the head as



Fig. 123.—Measle and Tapeworm Heads.

viewed diagonally, demonstrates that the four large suckers precisely resemble those of the beef measles; whilst the characteristic supplementary depression is somewhat more conspicuously developed. I have satisfied myself that this falsely so-called sucker does not strictly belong to the category of cup-shaped holdfasts—at least, not in the same sense as the ordinary suckers do—but it corresponds, both structurally and morphologically, to the head processes of such tapeworms as are furnished with retractile proboscides. It is in the tapeworms of birds especially that these appendages attain the most striking degree of development; their

principal function being to furnish a powerful means of anchorage. The presence of these organs often imparts a grotesque appearance to the head of the tapeworm, as may be seen, for example, in the case of the *Tenia paradoxa*, from the oyster-catcher. I have figured a specimen of this worm in my general treatise (p. 108). But, reverting to the illustrations, the profile view of the head of the beef tapeworm (Fig. 8, B above) shows this spurious sucker projecting beyond the middle line at the centre. I may mention that, during my examinations of the fresh parasite, I have repeatedly caused this organ both to project and retreat at my pleasure. I have, therefore, not the smallest doubt but that during life the process in question is perfectly capable of being thrust forward and backward at the will of the entozoon, as undoubtedly obtains to a more striking degree in the case of those tapeworms which are armed with a retractile proboscis or *rostellum*.

I have purposely dwelt upon the character and functions of the central organ because several able and estimable observers appear to have entirely misunderstood the nature of this structure. In the pages of *Nature*, indeed, I have already animadverted upon this prevalent error; but hitherto I have been unable to give adequate expression to the opinion, which is here offered only after a careful and prolonged investigation of the question at issue. In this relation, also, I have yet further to remark that the head of the pork tapeworm (as shown in the two lower representations) not only presents a quadrilobate figure when seen from above, as at A, but that it also exhibits a distinctly conical figure when viewed in profile, as seen at B. Moreover, the upper part of the *rostellum* displays a double circle or coronet of hooks, the points of which are seen to project conspicuously at the circumferential margin of the crown.

A full and satisfactory view of the beef measle can only be obtained by rupturing the cyst, and then, by subsequent gentle pressure, causing the head and neck to protrude from the receptacle. It will now be seen that the so-called neck, which some entozoologists with equal propriety term the body, presents a series of transverse folds which are correctly regarded as the limitation lines of a set of imperfectly developed segments. These, in the adult tapeworm, eventually become the earliest transformed sexually mature prog-

fectly formed. As seen in the specimen here drawn from a figure by Mosler, but much reduced, the measles do not in such cases merely occupy the surface of the organ, but extend throughout the entire thickness of the muscular walls (Fig. 125).

The slice of beef shown in Fig. 126 has been cut and unfolded so as to show four measles (*a*), which, lying pretty nearly on the same level, have been severally divided by the knife into more or less equal moieties.

BEEF TAPEWORM.

This is an accurate representation of a specimen measuring thirteen feet in length. It is taken from a photograph sent to me by Dr. Fock, of Utrecht, who is the author of a popular pamphlet on tapeworms (*"De lintworm en het middel om hem uit te drijven"*). Such a specimen as the one here figured numbers about 1,200



Fig. 127.—Beef Tapeworm (reduced to one-sixth).

joints or segments, each of these being capable of developing in its interior some 30,000 eggs; consequently, if all the joints of such a worm should arrive at perfection, they would collectively afford a total of more than thirty million of ova. It is not usual, however,

to find at one time more than seventy or eighty of the joints full of perfectly ripe eggs. On the other hand, it must be borne in mind that, as during life the ripe segments are cast off at the rate of about 400 per month, any one person who is playing the part of host to this worm is liable to be the means of dispersing abroad upwards of one hundred millions of these eggs annually.

HYDATIDS.

In addition to the beef measles, three other forms of tapeworm larvae are liable to take up their residence within the flesh of the ox. All of them are likewise guests of the sheep, in which last-named host they are destined to play a more conspicuous part in the production of disease. In so far as they may be considered as bovine entozoa, I shall reduce my present notice of them to the briefest possible limits.

It is the custom with veterinarians to speak of all the larger kinds of bladder worms as hydatids. This want of discrimination has naturally introduced much confusion into the literature of the subject. It has also prevented the diffusion of correct ideas respecting the mode of origination of the several and totally distinct species of parasites that are thus incongruously blended under a single title. We cannot now abandon the general term; yet, when not addressing the helminthologist, it is desirable to offer some distinctive prefix, in order to characterize the particular hydatid referred to. The first of the three bladder worms in question is the common hydatid. This parasite is almost as abundant in cattle as in sheep, and it has been described by naturalists under upwards of twenty different names. It is best known to us as the *Echinococcus veterinorum*. It infests mankind, monkeys, equine animals, and all ruminants. Specimens have also, it is said, been obtained from felines and rodents, and the distinguished zoologist Von Siebold also described an example taken from the lungs of a turkey.

The annexed and much-reduced illustration (Fig. 128), which unfortunately fails to do justice to the original coloured and life-size figure, is copied from a careful drawing made by the late Mrs. Cobbold, of Holywells, Ipswich, September 9, 1818. It supplies, nevertheless, a tolerably characteristic representation of the echino-

coccus disease as it shows itself in the lungs and liver of the sheep. Occasionally the hydatids are very much more numerous in the lung and liver than this figure actually represents them to be. On the 22nd of May, 1873, I had an opportunity of exhibiting to my class a remarkable example of the lungs and liver of a sheep, in which there were several hundred cysts, so densely packed together as to leave very little healthy lung and liver tissue. Nevertheless, the animal from which the diseased organs were obtained was very fat, and had not displayed any symptoms of the



Fig. 128.—Hydatids Encysted within the Lungs and Liver.

disease. The animal was sent from Norfolk, and was slaughtered for the London market in the ordinary way, no suspicions having arisen as to the presence of internal parasites.

Hydatids—apart from those producing "gid," or sturdy—are not merely a cause of disease in cattle, but also occasionally of death. In this connection it is much to be regretted that so few of the many cases occurring in veterinary practice are placed on record. In the *Veterinarian* for 1838, Mr. J. Stoddard gives the case of a cow where the liver was, after death, found to be "occupied with numerous hydatids;" yet it does not appear certain that the extensive inflammatory action, which proved the immediate cause

of the animal's death, had its origin from the parasites. In a somewhat similar case, however, recorded by Mr. J. Barnett in the same journal for 1865, there can be no doubt that the death of the bovine patient resulted from the injurious action of the entozoa. In this instructive case the liver contained multitudes of echinococcus vesicles, varying in size "from that of a marble to a small egg." The quantity of pale-coloured fluid contained in the smaller and larger vesicles collectively amounted, we are told, to "upwards of two gallons." A third case of a similar kind, seen by Mr. Meek, is also alluded to in Mr. Barnett's communication.

THE SLENDER-NECKED HYDATID.

This parasite (*Cysticercus tenuicollis*) is far less abundant in the ox than in the sheep. Its presence in the bovine bearer often escapes observation, chiefly because the parasite rarely occasions inconvenience to the host.

THE MANY-HEADED HYDATID.

As a fertile cause of "gid," or sturdy, in sheep, this common helminth has acquired notoriety, and it is well known to parasitologists under the title of *Cœnurus cerebralis*. When treating of the ovine entozoa I shall necessarily dwell at some length upon the general structure and development, and also upon the ravages committed and the symptoms set up by this bladder worm when lodged in the brain of sheep; but in the meanwhile it is proper to notice that the *cœnurus* not unfrequently gives rise to sturdy in cattle.

As in sheep, so in cattle, one of the most striking symptoms is the peculiar rotatory movement of the affected beast. Staggering, vertigo, sudden starting, inability to straighten the neck, difficulty of grazing, and subsequent impairment of vision, are amongst the other characteristic phenomena of the disease. Cases are not wanting, however, in which a similarity of symptoms may occur from other agents that are capable of producing symptoms of chronic compression of the brain.

STRONGLES.

The species of worm which gives rise to husk, or hoose, in cattle may be appropriately termed *the small-tailed strongle*. This parasite is known as the *Strongylus micrurus*. The female measures about three inches from head to tail; but the male acquires only half that length. As obtains with the other members of the family (*Strongylidæ*) the males have a kind of hood at the end of the tail. Males and females alike infest the *bronchi* of calves; their presence being productive of fatal mischief by blocking up the air passages.

Four other species of strongle have been indicated as infesting the calf and ox. These are, respectively, the "swollen strongle," which occurs in the small intestine (*Str. ventricosus*); the "inflated strongle," occupying the large intestine (*Str. inflatus*); the radiated strongle, found in the gall ducts (*Str. radiatus*); and the giant strongle (*Str. gigas*) whose right to be considered a true bovine parasite is disputed by some helminthologists.

Lastly, I may mention that there is yet another interesting little entozoon, not strictly belonging to the helminths, which alike infests the ox, the sheep, and herbivorous quadrupeds generally. This is the "toothed pentastome," or *Pentastoma denticulatum*, whose adult representative resides in the dog. It will, therefore, more appropriately engage our attention when we discuss the parasites proper to that animal.

CHAPTER XXIII.

BLOOD AND GENERAL DISEASES.

Plethora. — Anæmia. — Leukæmia. — Obesity. — Anthrax. — Quarter Evil. — Purpura Hæmorrhagica. — Eczema Epizootica. — Rinderpest. — Cow Pox. — Diphtheria. — Rheumatism. — Rickets. — Laminitis. — Scrofula. — Glanders. — Pyæmia. — Tumours, including Cancer and Nævi. — Parotitis.

PLETHORA.

AN excess of blood in the system, of superfluous richness containing a superabundance of red corpuscles, denotes the condition termed plethora—a condition which is very often *general* in young thriving and feeding stock, more particularly when there is a liberal allowance of highly nitrogenous and stimulating food.

Sir Thomas Watson observes: "Perhaps it may not be so obvious that the whole quantity of blood throughout the body is sometimes in excess. . . . Full living and a sedentary life are causes likely to occasion general plethora, and they do occasion it. The full diet, so long as the digestive powers are perfect, provides more chyle, conducts into the blood a larger quantity of its proper pabulum. . . . Their entire vascular system is preternaturally distended. If you open a vein you find that they [persons in a plethoric condition] bear a copious extraction of blood without fainting, and are even refreshed by it; and the blood drawn separates into a large and firm mass of coagulum, with but little serum. Keeping to the nomenclature we have already employed, we might say that there is here *hypertrophy* of the blood."

Symptoms.—Although plethoric animals usually look in healthy condition, there may always be observed an unusual heat of the skin, and more or less injection of the visible mucous membranes. The pulse is full and bounding, the bowels are frequently constipated, and there is an apparent drowsiness. Animals in this

state of system are more susceptible to contract acute blood diseases, and more readily succumb to them.

Treatment.—Depletion by bleeding, and aperients; reduction in the quantity of food, and its feeding qualities.

ANÆMIA.

This condition is the reverse of plethora, and denotes a deficiency or poverty of blood. The red globules are reduced in proportion, as also the albumen of the liquor sanguinis, whilst there is a preponderance of water, and often an excess of salts.

Causes.—Such a condition is usually brought about through excessive discharges of the various fluids of the body, but more particularly hæmorrhage; while exhaustive diseases, insufficient and innutritious food, overcrowding, defective ventilation and bad drainage, play their several parts in the production of anæmia.

Symptoms.—These are—paleness of the visible mucous membranes, lassitude, wasting, emaciation and debility; feeble rapid pulse, easily induced palpitation of the heart on excitement, and fatigue on slight exertion. “The anæmic condition is announced by abnormal sounds in various parts of the vascular system. These are called venous murmurs, and are ascribed to the thin, watery blood running with great rapidity in the ill-filled vessels, and are heard at the breast, at the base of the jugulars more particularly, and are, according to Dr. Williams, of the nature of ripples, “the natural inequalities of the surface over which the current of blood passes being sufficient to occasion, in its dilute and diminished condition, vibrations and sonorous gushes, which would not occur in a fluid of greater density.”—*Williams*. The extremities of anæmic animals are invariably cold and frequently dropsical, the skin is tight and dry, and the coat harsh, the appetite is variable, and indigestion is often present, indicated by eructations, tympany and colicky pains; constipation is also an accompaniment.

Treatment.—The cause is first to be removed, after which those agents best calculated to form the necessary constituents of healthy blood are to be prescribed. Of these, vegetable and mineral tonics (especially the preparations of iron), and codliver oil, stand pre-eminent. A nutritious diet, which should be *gradually* introduced

on account of the weak state of the digestive organs, together with careful attention to hygiene, will most materially assist in promoting convalescence.

LEUKÆMIA.

By leukaemia, or leucocythæmia, is known that condition of blood where there is a preponderance of white corpuscles, and at the same time a diminution of the red. A phenomenon which has given rise to the terms "white-cell blood," or white blood.

Causes.—Leukaemia follows excessive hæmorrhage, and exhausting disease, both chronic and acute; but in what manner the peculiar change of cell condition is wrought in the blood, scientists are unable to explain.

Diagnosis.—The diagnosis of the disease consists in demonstrating the extreme increase of the colourless blood-cells, which, according to Vogel, may be done as follows:

1. By microscopic examination of the blood, for which a single drop is sufficient. If the disease exists, the colourless corpuscles will be seen to form a sixth, a fourth, or even a half or more of the number of the red.

2. If a large quantity of blood is obtainable by venesection, or by the cupping-glasses, and freed from fibrine by heating, and placed in a narrow little glass, so that the corpuscles sink to the bottom, the upper part of the mass looks whitish coloured, like milk. The milky character does not vanish on agitation with æther, and is not produced by fat-globules suspended in the blood serum, but by the prodigious number of the colourless blood corpuscles.

3. The clot of leucocythæmic blood shows on its surface greyish-white granulations, which being observed under the microscope are seen to consist almost entirely of colourless corpuscles, distinguishing the condition from the ordinary buffy coat; and the separated serum being clear, not turbid, distinguishes the condition from a fatty condition of the blood.

4. In the dead subject there are found in the heart and in the great veins large soft semi-fluid greyish-yellow coagula, which, on microscopic examination, are seen to consist almost entirely of colourless corpuscles.

Symptoms.—A leucocythæmic animal is usually emaciated, and has a large and pendulous abdomen; there is often marked tumefaction of the latter over the hepatic region, due to enlargement of the liver and spleen. The visible mucous membranes are blanched, the pulse weak, appetite impaired, bowels irritable, and jaundice is not unfrequent. As the disease becomes chronic, ascites and anasarca are more pronounced, the limbs swell, the appetite is lost, and the animal wastes to a skeleton, hectic fever setting in towards the last.

Treatment.—Diffusible stimulants, mineral and vegetable tonics, nourishing food, cleanliness and pure atmosphere. Cod-liver oil may be given with advantage.

OBESITY.

I shall probably be antagonistic to the opinions held by the majority of stock-owners, or at all events feeders, in classing obesity as a disease. Whether, however, my view is right or not, the enormous accumulation of fat which is seen in what are termed Christmas cattle, is a condition unquestionably abnormal. An inordinately fat, in other words, obese animal, purposely made so, is simply fed to waste, the tallow-tub receives the bulk, and the benefit goes to the Chandler, not to the consumer. The time, without doubt, will come when these moving masses of grease will be passed over in the show-ring, and the honours awarded to those in a more natural condition, and with their points unhid by useless cushions of fat. Probably a yet wider view will be taken, viz., that animals so overburdened, unable to stand for long together, almost asphyxiated, as in the case of pigs, may be regarded as being cruelly tortured. In many instances which have come under my notice, my opinion would certainly confirm the latter. Consumers purchasing beef desire to have beef, and not to pay tenpence or elevenpence per pound for fat; which in obesity takes the place of the muscle required. That disease is induced by this pernicious system is self-evident. Liver disease is notably a result of the fattening process, and from my experience of morbid anatomy, I could illustrate other abnormalities, proving therefore that obesity is not only in itself a disease, but that other disease is engendered thereby.

It may be argued that nature should be the guide, and that so long as appetite remains, it should be satisfied; but gluttony is usually a morbid condition, and any departure from a normal state indicates its removal. A right application of the laws of hygiene and sanitary science will alone obviate these evils; and the public, instead of purchasing diseased and unprofitable Christmas fare, will then obtain healthy meat and value for their money.

ANTHRAX.

Under the term anthrax may be included various forms of disease arising from the same cause, viz., the presence of a vegetable organism (*Bacillus anthracis*) in the circulatory fluid.

As observed by Fleming, "The manifestations of anthrax observed in the living animal vary according as the disease runs its course as a general, localized, or non-localized blood disease. In the first, death is usually rapid; while in the other, besides the symptoms due to alterations of the blood, there are also those occasioned by the disturbance of the circulation and local nutrition."

The special forms of anthracoid disease met with in cattle are, "*Splenic-apoplexy*," "*Quarter-evil*," "*Gloss-anthrax*."

The causes favourable to the development of bacteria and the production of anthrax will be found mentioned in the discussion of these three forms.

QUARTER EVIL.

This disease is known under a variety of terms, as *Black Quarter*, *Black Leg*, *Quarter Felon*, *Speed*, *Struck*, *The Irons*, *Inflammatory Fever*, *Emphysema Infectuosum*, *Carbuncular Erysipelas* (Armatage), *Hæmato Sepsis* (Simonds), *Anthrax Fever*, etc.

Under some one of its appellations it is known in most districts. It chiefly confines itself to young and thriving stock, attacking them usually from the age of six to eighteen months; there are, however, exceptions to this rule, some being the subject of the disease at two years old, and even past that age; such cases, though, may be considered rare.

Causes.—High-bred and thriving stock, particularly those upon which the forcing system is exercised, are the ones generally attacked with quarter evil. It has been observed that the inability of young stock to appropriate the highly nutritious food as well as the old ones, may possibly be one of the cause why they are more susceptible to it. Neither is it by any means unlikely, for giving stock food of a richer quality, especially before arriving at maturity, or at all events on an unprepared system, than under ordinary circumstances they would have, and likewise in greater quantity, is calculated not only to interfere with the functions of the digestive organs, but the whole system generally. The various parts that act in the performance of sustaining animal life are really overstrained, and thus by too rapidly increasing, as this forcing plan must do, the quantity and quality of the blood, this peculiarly fatal disease is engendered. And the same argument will apply to many of the diseases cattle are prone to, especially those of an apoplectic nature. Sudden changes of temperature, as burning hot days and cold nights, have been said to produce this disease; but a very fruitful cause, in my opinion, is exposure to wet, or pasturing stock on low meadows, particularly at the fall of the year. A farmer in this county, with whom I was well acquainted, stated, that whenever he placed any young stock on an undrained clay-field belonging to his farm, they were invariably struck (seized with Quarter Evil); and when he gave up this land, he observed that if his successor put stock on it, he would be sure to lose them; and I have since been informed his prophecy was correct.

Mr. Fleming, an author of repute, in his admirable work on "Veterinary Sanitary Science," which all taking an interest in the welfare of stock should possess, in alluding to this class of disease, says: "In former ages, when the land was badly cultivated, and drainage was unknown or unpractised, anthrax, in its various forms, was far more common and severe than it now is, where improved methods of agriculture, and the removal of an excess of moisture from the soil, have been introduced. Great Britain was for many centuries, and even up to a recent date, greatly scourged by some of the most malignant and devastating of these forms, which were fatal, not only to the domesticated and feral creatures, but caused a large mortality among the people; now these have nearly disappeared (especially gloss-anthrax), or are only witnessed in remote districts

which retain their primitive condition and insalubrity. Perhaps the most common form, that which is known as 'black quarter,' was formerly quite common in localities where it is now never seen; and this disappearance would appear to be coincident with the introduction of drainage. The malady is still frequent, however, on retentive undrained clays. The same circumstance has been observed in other countries. Those most backward in agriculture suffer most extensively and fatally—as certain parts of Russia, and tropical countries in general."

Symptoms.—So rapidly does the disease run its course, that frequently no indications of illness are observed, and much consternation is displayed at finding what appeared a healthy animal the night before a dead one the following morning. Stiffness and swelling are the symptoms generally first noticed, affecting a fore or hind quarter (hence the term quarter evil); this swelling, which is at first hard and tender, becomes soft and puffy; and if the fingers are passed over it, a cracking noise is produced, due to the presence of gas in the areolar tissue, given off from the stagnant and decomposed blood. The pulse is rapid, weak, and nearly imperceptible; eyes red, visible mucous membranes injected, with ecchymose spots thereon; respiration laboured and painful, continual moaning, and extremities cold. These symptoms rapidly increase in intensity mortification sets in, and death closes the scene.

Post-mortem Appearances.—When the skin is removed, the vessels, chiefly at the affected part, are observed to be distended with blood, which is black and putrid, some of which has escaped through the walls of the vessels into the loose areolar tissue, and emits a most offensive smell. The mucous and serous membranes generally are found more or less congested, with extravasations of blood on them. This congested appearance is exhibited in most of the internal organs, thoracic and abdominal; and the vessels of the brain are in the same condition. After death, putrefaction rapidly takes place in the whole carcase.

Treatment.—This, in the majority of instances, is of very little use. If we have the opportunity of seeing a case in its early stages, bleeding should at once be had recourse to, but only at this stage; for when decomposition of the blood has once taken place, it is perfectly useless, and only tends to hasten death. This should be followed by the administration of a saline purgative, in combina-

tion with a diffusible stimulant, as brandy or spts. æther nit., $\frac{1}{2}$ pint of the former, or 2 oz. of the latter; either of which may be repeated at intervals of three hours, in gruel or linseed tea.

Of late years, antiseptics have come greatly and deservedly into repute, and in no class of disease is their use more indicated than in those of an anthracoid nature, like quarter evil. Carbolic and salicylic acids are both extremely useful. To restore the viscosity of the blood, Professor Williams recommends chlorate of potash in 3-drachm doses thrice a day in a pint of water, for young stock, and an additional drachm for a full-grown animal.

With regard to local treatment, the affected part should be freely scarified with a lance, and the incisions fomented with hot water, into which a little ammonia may advantageously be put. Embrocations are objectionable, as they clog up the incisions. If the case proceeds favourably, the treatment should be followed up with stimulants and tonics, as:

Sp. Æth. Nit.	1 ounce	} in gruel.
Tinc. Gentian Co.	1 ounce	

Or, Sulphate of Iron, $\frac{1}{2}$ oz. twice daily in a quart of old ale.

The diet must be nourishing, but not too rich, and of a laxative description; as gruel, linseed tea, and sloppy mashes.

Prevention.—When an outbreak occurs in a herd, my practice has always been to bleed the healthy ones, insert a seton (well stimulated) in the dew-lap, and administer a dose of laxative and alterative medicine, as follows:

Magnes. Sulph.	8-12 ounces.
Sulphur. Sub.	2 ounces.
Potass. Nitrate, or	} 1 ounce.
Potass Chlorate	
Zingib.	$\frac{1}{2}$ ounce.

It is also desirable to alter the system of feeding: if at grass, a change of pasture is indicated. In any case, irrespective of an outbreak, especially where the disease is prevalent, these measures should be adopted so far as the medicine and setoning are concerned—particularly the latter, which is without doubt one of the best preventatives of this disease.

Mr. Finlay Dun observes: Its importance has been sensibly set



forth by Mr. James Macgillivray, V.S., Rayne, in his prize report on quarter evil, in the Transactions of the Highland and Agricultural Society for January, 1862. From observations including 6,452 calves, Mr. Macgillivray shows, that in stock and localities subject to the complaint, 1 calf in every 6 was lost from black leg, whilst by setoning the mortality is reduced to 1 in 300." This I can, from my own experience, substantiate.

PURPURA HÆMORRHAGICA.

This peculiar and specific blood disease, characterized by extravasations of blood underneath the skin, and on the mucous and serous membranes, is occasionally seen in cattle, more particularly young stock.

Causes.—These are somewhat obscure. Purpura has been observed to follow debilitating disease, general impoverishment of system from insufficient and innutritious food, and defective sanitary arrangements. It has also on the contrary occurred where a distinctly opposite condition of things existed—the animals being in high condition (in fact *too high*, and excessively plethoric), and the sanitary arrangements as perfect as it is possible for them to be. In these latter it is reasonable to assume the digestive functions are impaired by the too abundant allowance of rich products—that the forcing system is again proving the error of artifice endeavouring to supplant nature.

Whether, however, purpura exists as a primary or secondary disease, it is perhaps most frequently traceable to defective hygienic and sanitary measures, whereby the blood becomes empoisoned, deficient in coagulating power, and extravasated in various parts of the organism.

Professor Williams observes: "It may safely be concluded that the causes of purpura are of a septic nature, and are due to the absorption of products of decomposition extrinsic to the body; to the severity and rapidity of tissue change within the body, either owing to a previous disease or debilitating circumstances, and to their accumulation when naturally generated, owing to impairment of the excretory organs."

Symptoms.—Associated with the extravasations of blood already

mentioned, there is usually swelling of the limbs, various dependent parts of the body, particularly the dewlap and abdomen; also the lips, nostrils, eyelids, and cheeks. Ultimately exudation through the thinnest part of the distended integument takes place, or extensive sloughings leaving gangrenous sores.

The urine is generally high-coloured—of strong ammoniacal odour—and sometimes contains an excess of albumen.

Constipation is usually present, but when intestinal extravasation of blood occurs, a violent and fatal purgation ensues.

Treatment.—Antiseptics, astringents, mineral tonics, and diffusible stimulants, are the agents attended with most success. The chlorate of potash and terchloride of iron stand pre-eminent therapeutically in the treatment of purpura. Of diffusible stimulants, brandy, and *spt. æther. nit.* are advisable.

External Treatment.—Consists in sponging the swellings with acidulated cold water. Strict attention should be paid to the cleanliness and ventilation of the building in which the patient may be located. Indeed, all the surroundings should be carefully taken into consideration, and especially the avoidance of all septic or contaminating influences. The food should be liberal in amount and nutritious without being too stimulating.

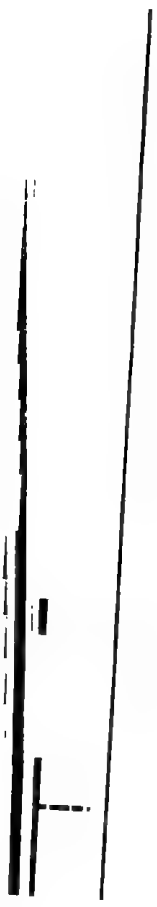
The following case of *Purpura Hæmorrhagica Bovinis*, was recorded by the author in the *Veterinary Journal*, November, 1880. On the morning of the 29th of August last, I was summoned to attend a six-months-old heifer calf at Perton Grove, supposed to have been kicked on the head. On my arrival I found the animal with a herd of eight, in the meadow, presenting the following symptoms: Disinclination to move, a stupid, bewildered expression of countenance, flanks tucked up, and breathing slightly laboured. A sanguineous discharge issued from both nostrils; the mucous membrane lining the chambers, and also that portion covering the septum, was dotted with patechial spots. They also existed on the under surface of the tongue, and on the buccal membrane on both sides of the mouth. The conjunctivæ were extremely injected, and the haw presented extensive blood extravasation. Without any hesitation I pronounced the case one of *Purpura Hæmorrhagica*, ordered the patient under cover, and a diffusible stimulant, but gave an unfavourable prognosis, and the probability of a fatal termination by night. On paying a second



Fig. 130.

L. WILKINSON, M.D. & J. CASTLE, F.R.S.

HEART OF CALF AFFECTED WITH PURPURA HÆMORRHAGICA
ORIGINAL



visit in the afternoon I found the prostration much greater, add to which, sanguineous oozings had commenced on several parts of the surface of the body, especially behind the shoulders; there were also some on the forearm.

In the evening, despite every means taken to support the animal, every symptom had advanced, and at about ten o'clock death took place.

Post-mortem Examination.—This I made the following morning, and an extraordinary, though characteristic condition of the disease was presented. The extravasation under the skin was extensive, but that internally was far greater. The surface of the peritoneal membrane covering the abdominal viscera was literally covered with patechial spots of various size and hue, from a bright scarlet to a deep purple. The abomasum was entirely suffused, and nearly approached a black hue. (See Plate 17, Fig. 129.) When opened, the mucous membrane lining it was a mass of scarlet elevations on a livid surface, and presented a most striking appearance. The membrane within the other stomachs, particularly the *manifold*, was also spotted and easily detached. The bladder, which was distended with urine, was likewise spotted. The diaphragm on both sides presented the same appearance.

On opening the thorax, these spots were found innumerable all over the costal walls. The lungs had a few towards the edges of the lobes. The thymus gland was loaded with extravasations, whilst the heart was covered with them, converging at its apex and forming one large livid blotch. (See Plate 18, Fig. 130.) A section revealed extensive sub-endocardial extravasation; a large portion of the membrane had a very bleached appearance, merging into a peculiar green shade. There were a few petechial spots on the valves, and one large diffused patch on the centre of the tricuspid. (See Plate 19, Fig. 131.)

Cause.—All the herd had been living extremely high, being well pastured in the daytime and housed at night; and in addition to other nutritive and stimulating food, were having bean-meal. This forcing-system applied to such young animals was, to my mind, the likely cause of the disease. At the same time, it should be mentioned that all were, and had been for some time, badly affected with ringworm, for which, since the 13th, they had been under my treatment, and were at the date of this attack of *Purpura*

Hæmorrhagica, recovered. Whether the long duration of ringworm, and extent of surface it covered, had any connection with the case described, is a matter for consideration. Possibly the long existence of ringworm had excited a condition of system which rendered them still more susceptible to the influence of overstimulating food.

Another of the herd commenced the same day with suspicious symptoms of the same disease, exhibiting a livid hue of the *caruncula lachrymalis*, and discoloured nasal membranes. A saline, followed by stimulants and iron, was prescribed, and on the third day she was convalescent. The remainder of the herd were also similarly treated. Disinfection, change of pasture, and a suspension of the bean-meal was also ordered, and they continued in good health.

ECZEMA EPIZOOTICA (FOOT AND MOUTH DISEASE).

This is an eruptive, febrile, contagious, and infectious disease, chiefly affecting cattle, sheep, goats, pigs, and deer. It has also been observed in hares, rabbits, dogs, poultry, horses, and human beings.

It is associated with the formation of small vesicles in the mouth, between the clays, and on the udder and teats. In sucking-animals the vesicular eruption has been found in the larynx, pharynx, stomach, and intestines.

That it is invariably due to contagion or infection there is not the slightest doubt; whether it is ever in this country a self-generated disease I am not at present prepared to say.

The unaccountable way in which at times it makes its appearance has had much to do in giving rise to the belief that it is a spontaneous disease; but when we consider how highly contagious it is, and the innumerable modes in which the infectious matter may be conveyed—as by birds, vermin, dogs, in fact animals of all descriptions, to say nothing of winds, streams, provender, bad hygiene, pregnancy, parturition, fair-cattle travelling from place to place, and a host of other mediums, it is not so surprising as it at first appears.

This disease is of serious consequence to the farmer, because if it occurs in a dairy it is attended with considerable decrease in the

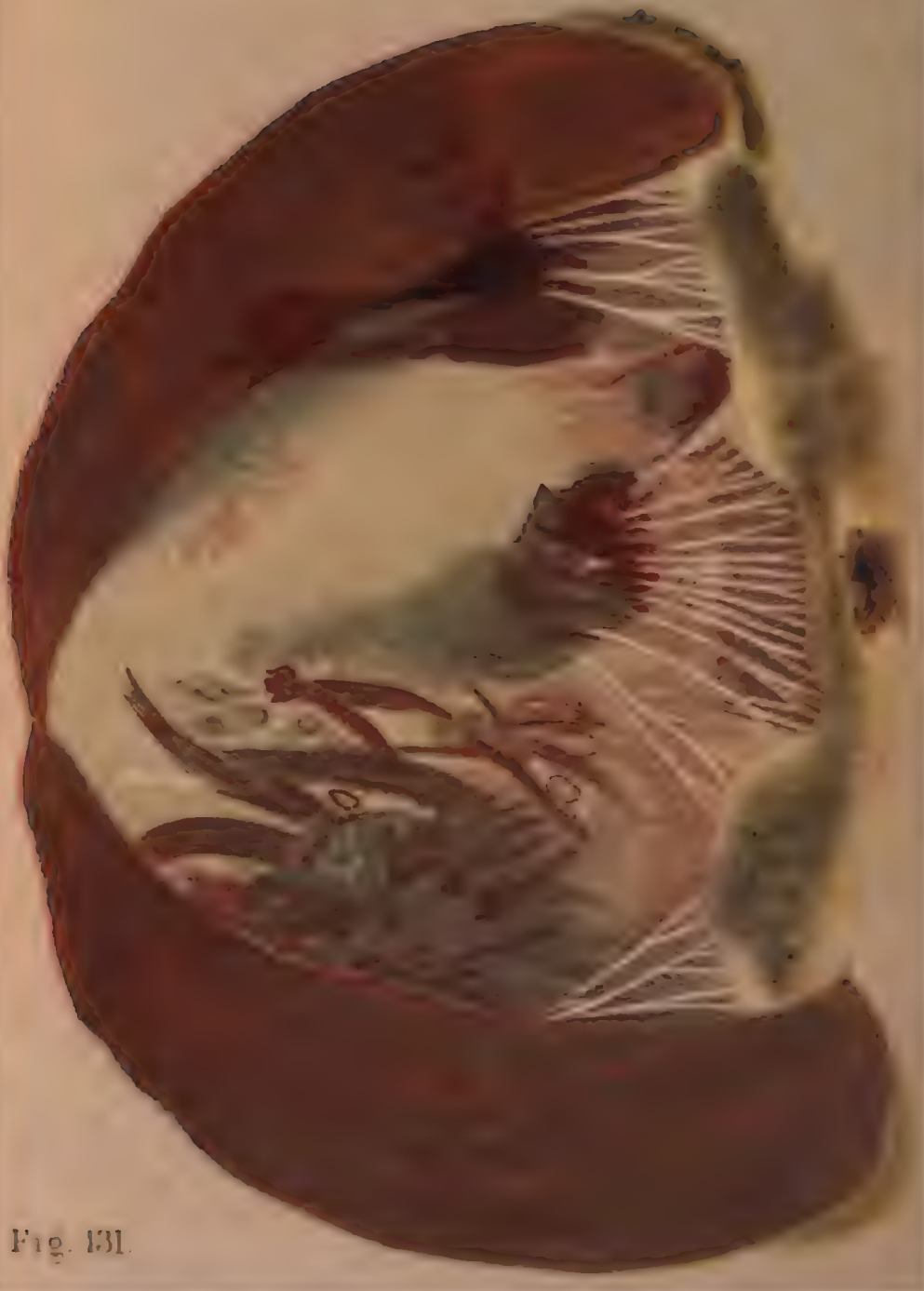


Fig. 131.

HEART OF CALF AFFECTED WITH PEPPIRA HEMORRHAGICA

and
ORIGINAL



supply of milk, and that which is supplied is not really fit for human consumption, and may be only given to the lower animals after being first exposed to a high temperature; and when it occurs in young feeding stock, considerable loss in condition often ensues, and a check, if improperly treated, is given to their growth.

Symptoms.—Disinclination for food, the animal stands apart from its companions with its back arched, shivering, increase of temperature, ranging from 102° to 107°. In cows there is diminished lacteal secretion, the milk usually assuming a yellow tint. The muzzle is hot and dry, mouth hot and sore, eyes watery. These symptoms are speedily followed by the formation of vesicles in the mouth, on the inner side of the upper lip, frequently extending in one large sore right across. Also on the tongue, chiefly on the upper surface towards the tip, occasionally on the side, very rarely on the under surface. The gums, dental pad, and lower lip may also become involved. The vesicles within the mouth are usually of a pale straw colour, varying in size from a shot to a pea, becoming as the disease proceeds paler and depressed in the centre. Their existence in the mouth is of brief duration, owing to friction of the tongue. Thick, ropy saliva is abundantly discharged from the mouth, mingled with shreds of detached mucous membrane; there is continual smacking of the lips and movement of the tongue.

Before the appearance of vesicles in the interdigital space there is considerable heat and tenderness round the coronet, with swelling and disinclination to stand or move. In from twenty-four to forty-eight hours vesicles are developed, extending, if neglected, round the coronet. After rupture the contents of the vesicles becomes inspissated and forms a deposit on the skin of the part of a cheesy nature, which emits an ammoniacal odour. The feet are frequently picked or snatched up, especially the hind ones.

"In some cases, the skin around the base of the horns becomes inflamed at the same time as that of the mouth or feet, and the horns are loosened. Occasionally also a vesicular eruption manifests itself at the orifice of the vagina, at the perineum and anus, or in the nostrils; and it sometimes happens that the eyes are affected, the conjunctival membrane becoming inflamed and suppurating, and phlyctenæ forming on the cornea. There may also

be nasal catarrh and symptoms of gastric derangement."—*Fleming's "Veterinary Sanitary Science."*

When the udder becomes involved the vesicles are either isolated or confluent. When isolated they are surrounded by a red circle. They may exist on the side, base, or point of the teat, and even on the gland itself, which may subsequently result in thickening of the organ. Frequently, when the vesicle is on the end of the teat, the disease has been known to extend to the lining membrane of the duct and create serious lesions, and lasting injury to the animal as a milk-producer.

If the disease is allowed to proceed unchecked, and without any regard to sanitary arrangements, the constitutional disturbance becomes aggravated, which is manifested by an increase of temperature, intestinal irritation, and rapid emaciation. In exceptional cases, sloughing of the hoofs and mammary gland, and death from pyæmia, or sympathetic fever, has occurred.

Treatment.—With regard to curative measures, many newspaper letters have been written, some advising one remedy, some another. Carbolic acid has especially been lauded, and rightly so, though it is no new agent, for during my residence in Yorkshire, eighteen years since, it was extensively used there as an external applicant. Concerning the hundred and one other remedies, some are, if not applicable, certainly harmless, whilst others are decidedly injurious.

Speaking generally, foot-and-mouth disease may be regarded as simple in character and easy of cure. True we have heard and read of numbers being lost, but in such fatalities no revelation as to the sanitary and hygienic measures adopted has been made, and such instances have usually impressed me with the notion of neglect, or something equivalent to it; for, out of some thousands of cases that have passed through my hands of this disease, I have never had a death. Very often nature herself will do all, if only cleanliness is observed. Let the feet be clogged with manure, the pus or vesicular matter allowed to remain, burrowing and causing separation of important structures, and the animals high in flesh and quality, and I can quite understand sympathetic fever being induced to such an extent as to prove dangerous; and when it is borne in mind how extremely sensitive the parts affected are in health, you will readily see that an animal of great weight, with

each foot it stands upon for support in a state of acute inflammation, that it is not surprising, if neglected, they should succumb to it. It is the feet that require the greatest amount of attention, and when I have to complain, it is of the condition I find these in. In large herds turned out, it may be remarked, this attention is impossible, but these are rarely visited so severely as farm-yard stock and those in stall-fed condition, which to some extent may be accounted for by the more natural conditions under which they live, and consequently the ability of their systems to resist disease. Certain it is that the more artificialized our domestic animals become, the more susceptible they are to take on disease.

As to internal treatment, a mild saline aperient is the best and first thing to be given, as—

Sulph. magnesia	8 ounces	} in three pints of cold water.
Potass nitrate	1 ounce	
Zingib.....	1 drachm	

Depression or debility may be counteracted by the administration of diffusible stimulants, as brandy, spts. æth. nit., or spts. arom. ammon., in gruel. One to two drachms of sulphate of iron in ale may also be given daily with advantage.

Possibly nothing is more grateful to the feverish sufferer, whose thirst is intense, than cold water, and this should be allowed *ad libitum*. When the temperature is high, 1 ounce of nitrate of potash may be put in each bucketful of water with benefit.

Concerning external applications, alum-water or vinegar and water usually suffice for the treatment of the mouth, which should be washed out twice or three times a day; the same also may be applied to the udder and teats. If, however, not found sufficiently active, a weak solution of perchloride of iron or tannic acid may be used.

In deep-milched cows, where there is much inflammation in the udder, great relief will be afforded by suspending the organ.

The feet should be thoroughly cleansed, and the affected parts dressed daily with carbolic acid and glycerine, 1 part of the former (Calvert's No. 1 solution) to 12 parts of the latter. All detached horn should be removed.

Professor Williams recommends as a foot dressing: 1 ounce of the concentrated solution of pure carbolic acid—1 part acid to 16

hot water—to 12 of the white lotion. Pledgets of tow dipped in this lotion are to be bound to the foot by a bandage. This simple expedient, he observes, so generally neglected, will often prevent a lameness of many weeks' or even months' duration; for suppuration once established to any great extent in the sensitive structures of the foot, causes violent pain, increases the inflammation, and induces the process of aloughing.

The diet should consist of slops, such as mashcs, boiled turnips, scalded oil-cake, gruel, etc.; nothing harder should be given so long as the mouth remains sore. When the abrasions in the mouth have healed, then it will be necessary to be more liberal in diet, and a pint or two of old ale will go a long way in restoring strength. It is rarely, if ever, that any other treatment is required than the above, if properly carried out.

Preventive Measures.—The notion that one attack of eczema epizootica renders an animal insusceptible to a second is an erroneous one; for cattle will not only take it a second, but a third time in one year. It is useless giving what are termed *preventive drenches*; where an outbreak occurs we may, however, with advantage administer a little alterative and antiseptic medicine to the healthy ones, as:

Magnes. Sulp.	6-12 ounces.
Sulphur Sub.	2-4 ounces.
Potass Nitrate	$\frac{1}{2}$ -1 ounce.
Zingib.	2-4 drachms.
Acid Carbolie, Cryst.	20-30 minims.

In a quart of warm water or thin gruel.

This will alter and improve the character of the blood, and render the system less liable to take on disease in a bad form.

Disinfectants are invaluable, especially if the animals are tied up, and no better agent can be employed than carbolic acid. Of course, care must be taken to prevent, as far as possible, any person or animal which has been in an infected district from going amongst healthy cattle. Where it breaks out in a herd at pasture, I am of opinion it is far better to let the whole remain and go through the disease, than to remove those apparently free to another part of the farm, and thus extend the infection.

RINDERPEST.

Rinderpest, la peste bovine, Steppe murrain, or best known in this country as cattle plague, may be looked upon as the most dire scourge of the bovine species; the havoc, losses, and ruination that its fearful visit to England in 1865 caused will long be remembered, and those who, like myself, had experience of the disease, cannot readily forget the misery and painful scenes we almost daily witnessed alike amongst the poor and prosperous.

To no member of the veterinary profession are we so much indebted for a thorough investigation and concise account of cattle plague as to John Gamgee, and therefore his definition of the disease may be accepted as trustworthy. He says: "The plague amongst horned stock which constantly pervades Russia, and especially steppe lands, is a specific, malignant, and highly contagious fever, known to us only as the result of direct or indirect communication from sick to healthy animals. It is entirely *sui generis*, and never originates spontaneously beyond the Russian frontiers, within which it is probably not generated at any time *de novo*, but is kept up by constant reproduction, after the manner of other contagious maladies. It is essentially a bovine disease, though it may be communicated to goats, sheep, deer, antelopes, gazelles, aurochs, zebu, and even the peccari—never attacking any animal more than once. It is characterized by a period of incubation which does not exceed ten days; by fever-heat, which precedes all other symptoms; redness of all the visible mucous membranes, seen early and in a marked manner in the vagina of cows; sometimes delirium, muscular twitchings, and fever shivers; discharges from eyes and nose; normal secretions checked or suppressed; abdominal pain, with constipation or diarrhoea; scaly eruption on back and loins, and a characteristic eruption on the inside of the thighs and on the mammae; there is a tendency to early putrefaction manifested by the foetor of the breath and discharges, and emphysematous swellings in various parts of the body before death; after death rapid decomposition sets in."

Causes.—So far, contagion is the only recognised cause of cattle plague. The same authority observes: "I am strongly disposed to regard the specific poison of the cattle plague as obeying the same laws of reproduction as those which we know regulate the develop-

ment of the virus of variola. We are asked again, How did the first case occur? We must give an Irishman's answer, and ask, How did the first case of human small-pox or hydrophobia occur? We can prove absolutely nothing as to their primary origin, and all we can say is, the most careful observations show that the transmission and pro-creation of certain animal poisons, including that of the cattle plague, obey laws similar to those which govern the transmission and pro-creation of living organisms."

As in other diseases, certain conditions are more favourable for its increase. Amongst these may be named individual susceptibility, insufficient space, filth, and other defective sanitary arrangements. Railway-trucks, cattle-markets, and slaughterhouses have been fruitful means of propagating this and many other diseases.

Incubation.—The incubative period is from four to eight days.

Symptoms.—An elevation of temperature, varying from 1° to 4° Fahr., is present in the earliest stage of the disease, and precedes every other symptom. The visible premonitory signs following this rise of temperature are: listlessness; irregular or suspended appetite and rumination; frequent shiverings; muscular twitchings; staring coat; and a husky cough, described by Professor Simonds as "like that of a broken-winded horse with a sore throat." As the disease develops, the pulse is accelerated, the respirations increased in frequency, the visible mucous membranes injected; the functions of the secretory and excretory organs are suspended; the eyes, nose, and mouth being dry and hot. A cessation of milk is an early symptom in cows. The appetite is entirely lost; the animal stands with arched back, the abdomen drawn up and the legs gathered together; the teeth are grated, and there are frequent low moans.

According to Gangee, the redness of the visible mucous membranes, especially of the gums, lips, and papillæ on the inside of the cheeks, is at first partial, pale, and patchy; and in milch-cows a red and mottled appearance of the lining membrane of the vulva and vagina is one of the first symptoms to look for.

From the eyes and nose there at first issues a glairy, watery, acrid discharge; and this subsequently becomes yellow and flaky, and accumulates at the inner canthus. Abdominal pains are indicated by the animal frequently lying down and rising again, stamping the hind-feet, and twisting the tail. At this stage an offensive diarrhoea usually commences, and emphysematous swellings appear

on various parts of the body, notably about the back and loins; the urine is scanty, and generally albuminous.

As the disease advances, all the symptoms enumerated increase in severity. "The dysentery is aggravated, and the animal becomes extremely weak; it stands and walks with difficulty, and lies much. The pulse becomes feeble and indistinct at the jaw; it beats from 90 to 130 per minute. The discharge from the eyes, nose, and vagina increases; the cough becomes less audible and soft. On the buccal and Schneiderian membranes, as well as in the clefts of the feet, there is a deep redness, with flaky discharge of epithelium. The muzzle, angles of the mouth, and membrane round the nasal orifices, are sometimes ulcerated, with a greenish-yellow and somewhat dense granular and epithelial deposit. On opening the mouth, a similar change about the base of the tongue and on the inside of the lips is often found. The coldness of the extremities, or of the body generally, the stupor or drowsiness, quick breathing, and fœtor of the exhalations, with spasmodic action of the *alæ nasi*, jerking respiration, and moaning, are among the most unfavourable symptoms. The *fæces*, at first dark, become slimy, charged with masses of detached epithelium, are very foetid, and more or less tinged with blood. The urine acquires a dark colour, due to the colouring principles of bile. Cows abort, and all symptoms of sensibility or consciousness gradually disappear.

"As death approaches, the mucous membranes often acquire a leaden hue; the erosions are marked, and blood-spots, or ecchymoses, occur. The partially open and dark-red or otherwise discoloured aspect of the inner surface of the lips or the vulva cannot fail to be noticed at this stage. The involuntary evacuation of excrement, extreme fœtor of all discharges, tendency to tympanitis, muscular twitchings, lowering of temperature, and increasing listlessness, betoken the approach of death."—*Gamgee*.

Duration.—Average, three to six days.

Post-mortem Appearances.—These vary according to the stage of the disease. Taking a case well advanced, they may be summed up briefly as follows:

Mouth excoriated; desquamation of the epithelium, particularly on the lower lip and gums; papillæ swollen, red, and frequently raw.

Fauces congested, turgid, and covered with yellow exudation.

Pharynx, dark red, and studded with small ulcers.

Larynx and trachea covered with fibrinous exudation in patches or layers of a dirty greenish-yellow colour and cheesy consistency.

Bronchial tubes loaded with imperfect casts of similar exudation, the lining mucous membrane of a deep red or purple colour.

Lungs congested, and notably distended and emphysematous.

Heart not invariably affected; but according to Simonds there is frequently ecchymose spots, particularly in the left ventricle.

Stomachs.—Rumen, partial and patchy redness, removal of epithelium, and frequently ulceration.

Reticulum.—Reddened mucous membrane, which is easily detached.

Omasum.—Patchy redness, ulceration between the leaves, which are not unfrequently perforated, with clinging impaction of the ingesta. Simonds lays great stress on this latter phenomenon. He says, in simple omasitis, if a transverse section is made through the leaves and the stomach shaken, the ingesta all drops out in dry pieces; while in cattle plague the fluid part may come away, but the other remains.

Abomasum.—This stomach is the principal seat of lesions. It is highly congested, thickened, and especially swollen near the pylorus, with characteristic depressions; a thick coat of greyish-yellow exudation covers its surface, and underneath the mucous membrane there are extensive extravasations of blood. Erosions and ulcerations in this compartment are also invariably present.

Intestines.—The appearance of these is variable. The small ones are occasionally singularly free from disease; at other times varying from a faint blush to a deeply congested or nearly black hue, and in severe cases the mucous membrane is covered with a dirty-grey exudation. The same variation may exist (but not so frequently) in the colon and rectum; but invariably the terminal portion of the latter is very much inflamed, due to some extent to the dysentery.

Dr. Murchison's observations are recorded as follows: "The small intestine is more or less inflamed throughout, but the inflammation is usually most intense about the middle. The coats of the bowels are much attenuated and softened, while the mucous membrane is intensely injected, and sometimes ecchymosed, and

deprived in a great measure of its epithelial covering, but coated with a quantity of transparent and viscid, or opaque and puriform, secretion. I have failed to discover any change of the solitary glands of the ileum which could be ascribed to the disease. Peyer's patches are usually less vascular than the surrounding mucous membrane, and throughout the disease very much less elevated and thickened than in a healthy animal. Their component glandules are more distinctly seen, because the epithelial covering which obscures them in health has been mostly removed. Many of the glandules seem empty, while others contain a minute drop of softened secretion like pus, which can be squeezed out by the slightest pressure. There are no submucous deposits, and none of the lesions running through the definite stages which I am familiar with in the typhoid or enteric fever of man. In this opinion I am corroborated by Dr. A. P. Stewart, Mr. Simon (Medical Officer of the Privy Council), Dr. Buchanan (my colleague at the Fever Hospital), Dr. J. Burdon Sanderson, and many other physicians who have dissected the animals, either in conjunction with me or independently. It is right to mention, however, that in all the cases which I have examined, many of the solitary glands, and sometimes certain of the component glandules of Peyer's patches, have been greatly enlarged, filled with a soft cheesy matter, and sometimes even ulcerated on the surface. A drawing of an inflamed piece of bowel, studded with these enlarged glands, might readily be thought to represent the lesions of enteric fever. Careful examination, however, clearly shows that the appearances in question are of old standing, and quite unconnected with the disease of which the animals have died. This view of the matter is confirmed by the fact that I have found precisely similar appearances, in some cases indeed even more strongly marked, in the small intestines of every one of four healthy oxen which I have examined."

Generative Organs.—In the male these rarely exhibit any specific lesions. In the female the injected condition of the vaginal mucous membrane has already been alluded to. The uterus occasionally becomes involved.

Liver.—In some instances this gland has exudation of lymph on its external surface, and there have been found layers of lymph in the gall-ducts and within the gall-bladder.

Kidneys.—These are at times red and swollen.

Spleen.—"This neither enlarged nor softened—a circumstance of great interest when taken in connection with the condition of this organ in the typhus and typhoid fevers of man, and in which it may be said to be uniformly altered."—*Gamgee*.

Mesenteric Glands.—These are frequently enlarged, and contain a yellowish-red exudation.

Microscopic Examination.—The blood is abnormally dark, and very slowly coagulates. According to Dr. Arthur Gamgee:

1st. The amount of serum is remarkably diminished.

2nd. The amount of fibrine is increased, especially in severe cases.

3rd. The amount of corpuscles is decidedly increased.

The milk, analyzed by the same authority, exhibits the following changes:

1st. The amount of sugar of milk is remarkably diminished.

2nd. The amount of butter is (except perhaps at the commencement) enormously increased.

3rd. The salts are slightly increased.

4th. The casein appears to be generally increased.

Treatment.—To enter fully into the numerous asserted successful remedies with which newspapers and journals teemed would occupy useless space in a work of this description. I shall therefore merely make mention of those agents I had an opportunity of proving most serviceable. The first medicine curative effects were believed to follow was chlorate of potash and muriatic acid, 2 drachms of each in 6 ounces of water, given twice daily in gruel or ale. This was, however, not found to possess the virtue attached to it, and it was superseded with more marked success by large doses of the tincture of perchloride of iron; and I have no hesitation in saying the latter drug in 1 ounce doses, combined with 1 drachm of tannic acid, given three times daily in port wine, or brandy and gruel, combined occasionally with opiates, forms the most effectual medicine in checking the intestinal hæmorrhage and ulceration. Beaten eggs, isinglass, solution of gum, gelatine, well-boiled wheat-flour gruel, or starch, with injections of the latter, are also invaluable associates. Disinfectants, notably carbolic acid, are indispensable; and the latter may with great advantage be administered internally. The food should consist of bland, mucilaginous matters. Nothing in the least degree irritating should be administered so long as

gastric or intestinal irritation is present, or for some time after convalescence. Isolation and strict sanitary measures should be rigidly practised. Under this treatment I witnessed the recovery of many valuable animals. Although the percentage of deaths was large, there is good reason to believe that had not the law of slaughter come into force, prosperity would have ultimately reigned where ruin and poverty existed, and from which unfortunate position many have not yet recovered.

COW-POX.

Cow-pox, variola, vaccinia, consists in a pustular eruption chiefly on the teats and udder, accompanied by more or less fever.

Causes.—These are somewhat obscure. Atmospherical influence would appear to be exercised in its production, from the fact of its being more frequently prevalent in spring. Stall-kept animals are, according to some authorities, more predisposed to variola than those at pasture. Plethora, and particularly those circumstances which cause increased blood-supply to the mammary-gland—as parturition, change of food, great fatigue, etc.—are mentioned by Fleming as predisposing causes.

Variola is essentially a female disease, though males may receive it by inoculation. Old and young are alike subject to it, but more frequently it appears in the adult animal. The disease commonly known as 'Grease' in the horse has, through transmission of the virus, either directly or indirectly, been productive of cow-pox. Others have alleged that it is derivable from the human subject, but, as Fleming observes, 'there is no proof of this. On the contrary, inoculation with the variolous matter of mankind will not produce vaccinia, and if people are reinoculated from the pustule produced at the point of inoculation they will have small-pox.' One attack of variola is security against a second.

Symptoms.—Cow-pox is divided into three stages: *papular*, *vesicular*, and *pustular*. The formation of papule is marked primarily by an inflamed condition of the skin covering the udder and teats, and subsequently red spots. Upon these red spots or patches small hard nodules (papule), peculiar for their thickness, appear. This stage lasts from three to four days; then the papule vesiculate, an accumulation of serum takes place, giving the vesicle

a bluish-white appearance. It is also depressed in its centre, and surrounded by a deep areola. The maximum development is attained from the eighth to the tenth day. The contents of the vesicle then become purulent, and the pustular form is established, which lasts two or three days; and then follows the crustation or scab.



Fig. 132.—Cow-Pox or Variola Vaccinæ.—*Armatage*.

"After slight febrile disturbance, partial loss of appetite and suspension of ruminating, trifling constipation and diminution of the urinary secretion—symptoms which may, nevertheless, be absent or unperceived—and lessened quantity as well as altered quality of the milk ('more watery and disposed to coagulate than usual'), the udder is observed to be swollen, particularly near the teats, and is painful during milking. Some days afterwards there are seen on the udder, and chiefly on the teats, small hard tumours, varying in size from a pea to that of a haricot bean, and of a pale red colour. Increasing in volume, beneath the epidermis there forms a viscid yellow fluid; at first this appears in the centre, but it extends towards the circumference, giving the nodosities a light blue tint in the middle, but a reddish-blue or yellow colour towards

the periphery: at this period the centre is also usually umbilicated or depressed. The border is hard, swollen, and painful, and when the skin is thin and transparent a red areole is noticed. These 'pocks' gradually increase in dimensions, and towards the eighth or tenth day have acquired their maximum development; on the udder they are generally circular, and on the teats oblong. The contents then become purulent, and a crust begins to form in the centre, extending to the margin; this crust is thick, shining, and deep brown or black in colour; it is firmly attached to the skin, from which it does not become detached until the tenth or fifteenth day, unless accidentally removed. When it has fallen off it leaves a cicatrix on the skin, which persists for a considerable period, and is at first bluish-red in colour, but gradually becomes pale. On the udder the cicatrix is depressed in the centre.

"In the same animal there may be successive crops of pustules, or they may not all be developed simultaneously, some being crusted, while others are only nodes. This later eruption may, however, be due to re-inoculation during milking, and this is favoured by the existence of sores or cracks on the teats.

"In consequence of this circumstance the malady may not pass through all its phases within a less period than four to six weeks. It is usually towards the eighth or ninth day of the development of the pustule that the vaccine matter is collected."—*Fleming*.

Treatment.—This consists chiefly in cleanliness and general attention to hygiene. Mild saline aperients may be given with advantage, and subsequently, in the pustular stage, diffusible stimulants and mineral tonics. Care should be exercised in milking, and if the formation of scab occurs at the end of the teat, the syphon should be used. It is scarcely necessary to observe that the milk is unfit for consumption. Isolation and disinfection should be rigidly enforced.

DIPHTHERIA.

Diphtheria proper, as observed in the human being, is a disease concerning which we have but scant information in bovine pathology. Whether those conditions now termed diphtheritic bear a true relation to human diphtheria is a matter now receiving special attention. Professor Dammann, Director of the Hanover

Veterinary School, has contributed in no small degree to the information on this subject. In the malady known as gangrenous or tuberculous stomatitis, a condition of the throat very closely approaching diphtheria exists. On the tonsils and adjacent structures a more or less adherent greyish membrane is found, and, in advanced cases, suppuration, with films or casts of lymph of the larynx, trachea, and bronchi. This form, however, is usually only met with in calves. Professor Williams mentions a description of croup as affecting "young cattle, varying from a few weeks to a few months old, when kept on low, damp pastures, more especially in meadows near rivers, and during the fall of the year."

Armatage, under the heading of "croup," speaks of it only as in the cow, and arising from simple catarrh, modified by some peculiarity of system, as well as that probably of the causes themselves. Gamgee also describes it under the same head, and Mr. James Law gives a paper on the subject in the third volume of the *Edinburgh Veterinary Review*. Fleming observes: "In all species young creatures are most predisposed, and this is most marked in the bovine species, the malady being almost entirely confined to animals under a year old."

It is certain a form of bovine diphtheria does occur, and that it is both infectious and contagious, and from experiment transmissible to other creatures and man, as in like manner is human diphtheria *vice versa*.

Symptoms.—The disease is usually ushered in with depression, rigors, stiffness about the neck, increased temperature, respiration, and pulse. Soon difficulty in swallowing is manifested, a discharge of mucus issues from the nostrils and saliva from the mouth. (A circumscribed swelling may at this period appear in one or both cheeks.) A cough commences which ultimately becomes violent, and dislodges casts of the bronchi. The inspiration is "crowing," and laryngeal spasm is frequent and easily excited by disturbance. On opening the mouth a greyish exudation will be seen on the palate, posterior part of the tongue, and cheeks. Prostration and emaciation are rapid, and death results from asphyxia, blood-poisoning, or exhaustion.

The symptoms of diphtheria, as Fleming observes, "vary not only in individuals or species, but in different outbreaks.

"In one outbreak, and usually most frequently, the respiratory

passages will be chiefly involved—the nostrils, pharynx, larynx, trachea, and bronchial tubes, and even the lungs and pleural membrane, being implicated, though the upper air-passages are oftenest the seat of pseudo-membranes. The symptoms in any case are very marked.

“In another outbreak the digestive tract will offer the most marked lesions. The buccal, labial, lingual, pharyngeal, and palatine mucous membrane, as well as that of the nostrils and upper air-passages, is swollen, congested, red or violet in colour, and covered in patches by greyish-yellow, tough, fibrinous masses, which are with difficulty removed; though from time to time portions are detached and coughed out, or are carried away by the saliva or nasal discharge, leaving raw surfaces. Deglutition and respiration are performed with difficulty, and the upper part of the neck or throat is swollen and painful. Diphtheritic enteritis is not at all uncommon among animals, and is usually complicated with disease in the mouth and pharynx.* Diphtheritic ophthalmia is not an unusual accompaniment, leading to perforation of the cornea and destruction of the eye; and in bovine animals fibrinous deposits have been observed between the digits and around the pasterns, and the hoofs and even the horns may be shed. In animals suffering from diphtheria, when there happen to be sores or abrasions on the surface of the body, these are very often covered with diphtheritic exudations; while beneath the skin in various regions are sometimes found nodular masses of the same nature as the false membranes. The bladder may be involved; and in pregnant animals abortion takes place when the uterine mucous membrane is also the seat of diphtheritic inflammation.”†

From experiments instituted by able pathologists and investigators, notably M. Talamon, diphtheria would appear beyond doubt to be of a parasitic nature. Mycelium and spores exist, the former being tubes with partitions, which under favourable circumstances elongate and bifurcate. The latter, the spores of germination, are of two kinds, round or oval, and possessed of strong inoculative power.

* This was markedly shown in a recent outbreak of tuberculous stomatitis which came under my notice. See coloured plates.—*J. W. H.*

† ‘The Transmissibility of Diphtheria from Animals to Mankind,’ *Veterinary Journal*, September, 1881.

The association of diphtheria with mammitis, *i.e.* the production of the former in man through the medium of milk derived from a cow suffering from garget, has not yet been proved; nevertheless, the question is one of great importance, and suggests grave consideration. "If," as Fleming asks concerning the malady known as "tubercular stomatitis," "the disease in the calves is produced by the milk of the cow, why may not this milk also produce the same malady in man?" and, as Dammann further remarks: "If the disease was communicated to the calves by the milk, the question presents itself as to whether the use of the same sort of milk may not account for the occurrence of certain cases of sore throat or mouth in the human consumer. *Isolated cases of sore throat often occur among farm servants*, where ugly-looking yellowish spots or deposits are found in various parts of the throat, and even the mouth, requiring a good deal of brushing and dusting with very strong caustics."

It is an unquestionable fact that the lacteal secretion is a very common vehicle for the propagation of disease, independent of which, the mucous membrane of the udder is as susceptible to inoculation as are other mucous membranes, and therefore, as Fleming states, "there is no difficulty in understanding that a calf suffering from diphtheria, and applying its mouth to the teats of the mammae, might readily infect the gland, and through it the cow. Granted, therefore, that the malady is readily transmissible from bovine to bovine, and that the calf—leaving out of sight the manner in which it may become infected—may transmit the infection to the udder of the cow, there is every reason to assume that the secretion of the gland is rendered infective, and will convey diphtheria to other creatures which consume it; and as man can receive the disease from the bovine and other species, there is scarcely any doubt that the disorder might become spread among people, and especially young children, by milk containing the diphtheritic germs which have been developed in the udder of the cow."

Treatment.—As in human medicine, no specific is known. The measures most successful are the inhalation of acid vapour, produced by ordinary vinegar, sulphurous or acetic acid; the inhalation of iodine; dressing the throat with tincture of perchloride of iron and glycerine, or tannic acid and glycerine; the administration of iron, iodide of potassium, chlorate of potash,

stimulants and nutritious food; warm and comfortable housing, cleanliness, antiseptics and disinfection. If the animal is threatened with suffocation, tracheotomy should be performed; and when swallowing is prevented, nutrient enemata given.

RHEUMATISM.

This is very commonly met with in cattle, and, as in human pathology, the disease is referable to an excess of lactic and lithic acid in the blood. At least, experiments made, notably by Dr. Richardson, have given weight to this opinion, and, as Sir Thomas Watson observes: "The acid properties of the perspiration, as manifested even by its peculiar smell—of the saliva, as tested by litmus paper—of the urine, as shown by its deposits, warrant the hypothesis that the poison which the whole disorder would seem to be an effort to discharge from the blood is some sort of *acid*. At all events, we know that the conversion of the starchy compositions of food into lactic acid, and its subsequent combination with oxygen to form carbonic acid and water, is essential for the maintenance of animal heat; and that whatever interferes with the progress of these natural changes, leads to the accumulation of lactic acid in the system."

Decreased activity of the skin appears also to be influential in the development of rheumatic affections.

Dr. Aitken gives the following definition of the disease: "Febrile excitement, probably due to a morbid state of the system by constitutional development, and expressed by inflammation of a peculiar kind in the parts about the joints, especially in the white fibrous tissue, such, for instance, as the sheaths of the muscles and muscular fibres, tendons, aponeurosis, bursæ, capsular ligaments, periosteum, and pericardium. The various local phenomena of the disease have a tendency to shift from part to part, the most remote from each other; and the febrile state is accompanied by profuse acid secretions from the skin, by the separation, in some cases, of large quantities of uric and sulphuric acid through the kidneys, and by a highly fibrinous condition of the blood."

Rheumatism in cattle is most commonly met with under those forms vulgarly known as *cold felon*, *joint felon*, and *chine felon*.

The disease assumes an *acute* and a *chronic* form. An attack of the former frequently terminates in the latter, which may remain

through life, and become increased in severity with changes of temperature; or, if the former disappears without degenerating into the latter, periodical returns of it very often occur. As in human beings, valvular disease of the heart is one of the serious complications of rheumatism which generally, sooner or later, causes the death of the animal.

Causes.—Exposure to damp and cold; hence its frequency during spring and autumn, and especially in low-lying districts. Hereditary predisposition.

Symptoms.—In the acute form of general rheumatism there is restlessness and fever; the skin is dry, harsh, and tight, the coat staring; flinching on spinal pressure, disinclination to move, appetite capricious, high temperature, pulse accelerated and somewhat hard, visible mucous membranes injected, constipation, scanty and deep-coloured urine; and in milch-cows, diminished lacteal secretion.

In acute articular rheumatism (joint felon) the affected joints are hot, inflamed, painful, and swollen. The animal moves about with extreme difficulty, and frequently moans from the torture it suffers. A remarkable feature of the disease is its tendency to move from place to place—a joint suddenly becomes affected, and as suddenly the disease may leave it (or continue there), and appear with the same short notice in another part.

In lumbago (chine felon), the animal walks with its back arched, and with a dragging paralytic gait; pressure or manipulation about the loins causes intense pain, due to the affection of the lumbar fascia; there is great disinclination to move, the bowels are obstinately constipated, and the urine is high-coloured, scanty, and turbid.

Treatment.—Assuming rheumatism to be due to the presence of lactic acid in excess, alkaline agents would appear to be those indicated in the treatment of the disease, and my own experience has proved their use is attended with marked benefit. In the first instance it is advisable to administer a saline purgative, and after its operation 4 or 8 drachms of carbonate of potash or soda twice or three times a day may be given in a pint of thin gruel. Opium or aconite is indicated where the febrile symptoms are urgent and the pain excessive.

A fixed rule of treatment, however, cannot be laid down for

every case of rheumatism. Cases occur which will not yield to alkalies alone; the addition of colchicum, $\frac{1}{2}$ to 2 drachms, is in such instances frequently of great service. Antimony and cinchona have also been beneficially employed. Calomel—recommended by some authorities—is, in my opinion, not a desirable agent; for not only is its use attended with susceptibility to cold in the patient it is administered to, and which in rheumatic affections should especially be avoided, but by its depressing and salivatory effects, hinders the removal of a complaint which requires a very opposite treatment.

Finlay Dun advocates the following measures: "In cattle, bleed freely in the earlier stages of acute rheumatism; open the bowels, and administer 20 minims of Fleming's tincture of aconite, or eight times that quantity of the Pharmacopœia preparation, an ounce of nitre, and 2 drachms of powdered colchicum, in gruel, every three hours, until the pain and fever are abated, or until ten or twelve doses have been given. Lodge warmly and comfortably, and apply the hot smoothing-iron, or the rugs and boiling water, as advised for horses. Keep the bowels, skin and kidneys in activity with 3 ounces of sulphur, 2 ounces of ginger, and 1 of nitre, given once or twice daily, and when the more acute symptoms are subdued, try an ounce of oil of turpentine and 2 drachms of colchicum morning and night."

With regard to local applications, warm fomentations, which may be rendered alkaline or sedative, are in severe cases (particularly of articular rheumatism) serviceable.

The patient should throughout be kept warm and dry, a non-stimulating diet allowed, and nitrated water given to drink.

Chronic rheumatism, speaking generally, is milder in its character than the acute form, more stationary, and less painful. An animal so affected moves stiffly, but apparently (except in the first instance) with no great suffering. Where, however, it is articular, much more pain occurs, the joints become hard, lumpy, and very much deformed. In various changes of weather, particularly when easterly winds or wet prevails, these enlargements become hot and tender, and the animal's symptoms resemble more those of acute rheumatism. Owing to ankylosis taking place the joint becomes comparatively useless; the animal in consequence lies almost continually, losing flesh, contracting sores, and feeding

sparingly. In addition to the ankylosed joint (Fig. 133) calcification or ossification of the ligaments and fascia may occur, and the limb above and below the joint becomes swollen, painful, and powerless; suppuration and a continued discharge of pus, accompanied by rapid emaciation and hectic fever, result, and, after lingering suffering, death.



Fig. 133.—Knee-joint of an Ox, after Chronic Rheumatism.—*Armatage*.

Treatment.—Medicinally, carbonate of ammonia and iodide of potassium in 2 to 4 drachm doses. Subcutaneous injection of morphia.

Locally, hand-rubbings, turpentine and ammonia embrocations, blisters, iodine, sedative liniments, magnetism, galvanism, avoidance of cold and damp.

When the valves of the heart become involved, little can be done beyond avoiding excitement, applying counter-irritation to the left side, and reducing by medicinal agents the excessive action of the heart. Aconite will be in such a case found serviceable.

RICKETS.

Rachitis, or rickets, consists in a vitiated or abnormal condition of bone-structure; in other words, defective nutrition. There is a deficiency of earthy matter, and a preponderance of animal matter; and the bones from this cause being soft, muscular action and weight bring about the various deformities met with in this disease. As in the canine species, the morbid, unhealthy state of system created by inter-breeding has a strong influence in the production of a rachitic diathesis in cattle. It is essentially a disease of young animals, and not unfrequently commences during uterine existence.

The bones of the limbs, the fore ones more particularly, are those generally distorted. The facial bones are not unfrequently very prominent or bulging, giving the countenance a swollen appearance. The loins are generally narrow, the hocks bent in and enlarged, giving the hind-parts an undeveloped or wasted look. The coat is harsh and staring; the mucous membranes are pallid; the sclerotic of the eye being particularly white; and the animal, taking it altogether, is an unthrifty, stunted, miserable-looking object.

I have mentioned inter-breeding as influential in the production of rickets, and in addition, or independent of this evil, may be named bad food, impure air, close confinement, and over-feeding (especially with matter deficient in bone-making properties), or insufficient food. Rickets in the human subject involves bones other than those supporting weight; hence general deformity, and particularly spinal curvature. This is rarely if ever the case with calves (excepting, as mentioned, in the facial bones), more particularly as regards the ribs and spinal column; therefore it may be taken as a general rule that bovine rickets, when it does exist, only does so in a partial form. The position of the body probably exercises a considerable influence in this respect, the same weight on the spinal column not being brought to bear as in the erect position of the human being.

Treatment.—This chiefly consists in avoiding those causes which have been enumerated as giving rise to the malady. When the disease is established, then it will be necessary to adopt, in conjunction with hygienics, medical treatment. Bearing in mind that defective nutrition is the original cause, it behoves us to remedy, as far as lies in our power, the existing evil. We have seen that

the bones are deficient in earthy materials; our object should therefore be to supply what is required. Mineral tonics are especially indicated. Phosphate of iron, phosphate of lime, bone-filings, or lime-water mixed with good oatmeal gruel, are exceedingly beneficial. Cod-liver oil is also a useful adjunct. Daily exercise is advantageous.

LAMINITIS.

Laminitis, commonly known as "fever in the feet," denotes inflammation of the sensitive structure of the foot, and is most frequently met with in working oxen. Highly-fed and over-driven cattle are also afflicted with laminitis; and occasionally a special form of the disease is observed in parturient cows, termed "parturient laminitis," but perhaps more properly known as "*simple vitulary fever*," a case of which I recorded in the *Veterinary Journal*, November, 1880.

Symptoms.—These are similar to those portrayed in the horse. The affected feet are abnormally hot; great restlessness is manifested; the animal stands with difficulty, and in acute pain. If recumbent, she rarely rises unless forced to do so—an operation which causes intense suffering, the limbs trembling, the whole body shaking, accompanied by violent agitation and perspiration. The pulse is quick and hard, the respiration hurried, rumination suspended, appetite lost, lacteal secretion (in milch cows) diminished, bowels constipated, associated with great general depression. As in the horse, more or less convexity of the soles results. Death may take place from nervous exhaustion, excessive pain, or suppuration followed by pyæmia.

Treatment.—A saline aperient, followed by sedatives, and in very acute cases the abstraction of blood from the coronets, will be found beneficial.

Locally, cold bran poultices; mild, stimulating liniment to the coronets; soft litter; light, laxative diet; nitrated water; moderate warmth.

SCROFULA.

Scrofula and tuberculosis are usually spoken and written of as identical, but a considerable difference of opinion still exists on this point. The view held by Sir James Paget as to their relation is as follows: "The scrofulous constitution implies a peculiar liability

to the tuberculous diseases, and that they often co-exist. But their differences are evident, in that many instances of scrofula (in the ordinary meaning of the word) exist with intense and long-continued disease, but without tuberculous deposit; that as many instances of tuberculous disease may be found without any of the non-tuberculous affections of scrofula; that, as Mr. Simon has proved, while diseases of 'defective power' may be experimentally produced in animals by insufficient nutriment and other debilitating influences, tuberculous diseases are hardly artificially producible;* and that nearly all other diseases may co-exist with the scrofulous, but some are nearly incompatible with the tuberculous."

Ansell, in his treatise on Tuberculosis, remarks: "The whole question, then, is—whether the disease of the blood which leads to the deposit of tubercle, and that which gives the specific character to scrofulous affections, is essentially the same? I believe it is, and that the domains of pathology contain irrefragable proofs thereof."

Aitken observes: "*Scrofulosis* is the general constitutional state in which this *tuberculizing* process occurs, and which commonly leads to *tuberculosis*."

My own opinion is that scrofula and tubercle are identical; in other words, that they are one and the same disease existing under different conditions; or, as Mr. J. H. Steel, M.R.C.V.S., happily puts it, "Scrofula is the disease of the system of which *tubercle* is the local manifestation."

Tuberculosis has already been discussed in the chapter on "Diseases of the Respiratory Organs," under the heading "Consumption;" so that I shall only briefly dwell on its constitutional predisposing cause—scrofula.

Scrofula is a malady almost peculiar to the bovine species. Its development is favoured by nearly all conditions which render the blood unhealthy. Malformations of the chest, defective structure of the lungs, diseased nutrition, have been asserted influential conditions in its production. Its hereditariness is unquestionable, and therefore, as Mr. Steel observes, and as I have in a recent controversy on the subject contended, "it manifests its presence most forcibly after 'breeding in and in.'"

* There has been abundant evidence to the contrary. The transmissibility of tuberculosis is proved beyond doubt. Mr. Fleming has more than once made this point clear and my own observations confirm it.—J. W. H.

Symptoms.—"Chronic enlargement, with suppuration, of the lymphatic glands is one of the earliest and most characteristic manifestations of scrofula" (*Gant*). This is especially noticeable in calves.

Under the head of "General Symptoms" the same authority says: "Scrofula exhibits itself locally by 'mal-nutrition and chronic inflammation.' This inflammation is scarcely expressed by pain, or heat, or redness, but rather by swelling, more or less considerable and doughy, slowly enlarging, and tending to suppuration; yet scrofulous suppuration is unwilling, so to speak, and the pus a mixture of curd and serum. Should a scrofulous abscess point, the skin thins, but gradually, and assumes a purplish tint; an irregular rent follows after some time, and the flaky matter rolls out. Perhaps this aperture gets blocked up and imperfectly closed—the matter re-accumulating, again to be discharged, and so on from time to time; or the aperture may remain free, with puffy, everted edges of a purplish colour, and the discharge continue, now thick, now thin.

"The *scrofulous ulcer* which eventually results is equally indolent. It persists with a thin, livid, undermined margin; large, pale, flabby granulations, and a gleety discharge; although sometimes pretending to heal, by this discharge crusting over its surface. Should cicatrization ensue, the scrofulous cicatrice appears drawn, puckered, and incomplete. Small bridges form across the ulcer, underneath which a probe can be passed readily in and out here and there. Nature does but 'skin and film the ulcerous spot.'

"*Special Forms.*—Scrofula is essentially a 'pervading' disease. It blossoms and bears fruit chiefly in the absorbent glands, in the skin and cellular texture, mucous membranes, bones and joints, eyes, salivary glands, tonsils, ears, breasts, and in the testicles. Then again, in some cases, various parts are simultaneously affected; in others consecutively, the scrofulous affection 'migrating' from one texture or part to another texture or part. But their order of priority cannot be stated with accuracy. In some textures the scrofulous affection is more pronounced than in others.

"*Absorbent glands*, so-called, appear to invite the deposit of scrofulous matter. At first soft and fleshy, these glands enlarge and harden; portions of each gland are observed to have altogether lost their flesh-colour, and acquired a degree of transparency, and

a texture approaching to that of cartilage. At length a soft, white, or yellowish curd-like substance is deposited. An enlarged scrofulous gland is not necessarily impervious—at least, mercury can be injected in many instances. Scrofulous glands are remarkably indolent, but eventually they soften and discharge the peculiar pus—flaky and ichorous, perhaps cretaceous matter; or they remain as soft and spongy tumours beneath a thin, silky cuticle, which frequently breaks and oozes; or they waste, and are at length represented only by a few bands of condensed cellular tissue attached to the cicatrized integument."

Indeed, as in the human subject, so in the ox, nearly every portion of the system more or less is liable to receive the deposit of scrofula. Frequently I have observed it in the joints (see p. 55), the cellular texture, in the sub-maxillary, and notably in the parotid glands; in the sheaths of the muscles, and occasionally in the mammary gland and testicles.

The most frequent location, however, of bovine scrofula, is in the mesenteric glands (*tubes mesenterica*). Many valuable animals are yearly lost from this grave form of the disease, commonly known as "consumption of the bowels." The symptoms are very plainly indicated in the ox. There is frequent abdominal pain; the abdomen is enlarged and tense; very often the diseased mass may be felt by digital pressure. This was very perceptible in a case which recently came under my notice—a two-year-old Alderney. This animal had ceased to grow almost from calfhood—she was no larger than a small deer. It was respecting her diminutive size, associated with continual diarrhoea and emaciation, that I was consulted. The abdomen was enormously distended, and the enlarged mesenteric glands could be distinctly felt by kneading the abdomen with the fist; in fact, it felt like a bag of large stones. She was slaughtered, and the diagnosis proved correct.

The body, in *tubes mesenterica*, is emaciated; and this emaciation is not difficult to understand, when, as Dr. Giant remarks, "by arresting the absorption and passage of chyle through these glands, by reason of their having undergone scrofulous inflammation, the whole body is inevitably deprived of its nutriment." The coat is harsh and staring, an irritable condition of the bowels is more or less present, and the animal, in short, presents a general unthrifty appearance.

Treatment.—This consists more in preventive than remedial measures. All predisposing causes should be avoided. The food should be light, digestible, and not excessive. It is better to feed oftener and in small quantities, than to overload the stomach by a heavy meal. Sanitary arrangements are also matters of importance. The habitation should be light, well ventilated and drained, and moderately warm.

Curative treatment comprises those agents of well-known therapeutic value, as the various preparations of iron, ammonia, bark, cod-liver oil, and iodide of potassium. The latter is invariably beneficial in scrofulous deposit. Externally, iodine may be applied to glandular enlargements in the shape of the tincture, liniment, or ointment. Abscesses must be treated according to their conditions.

CHRONIC SCROFULOUS SYNOVITIS.

Several cases of this description have come under the author's notice, traceable, in almost every instance, to "in-and-in" breeding.

Structural Condition.—"A pulpy or gelatinous degeneration of the synovial membrane, resulting from inflammation of a chronic character, modified by a scrofulous constitutional condition. The synovial membrane, in this state, is thickened and converted into a soft yellowish or light-brown gelatinous material; more vascular also than the healthy membrane. This change may be partial in its extent, affecting only the membrane reflected over the ligaments, or over the cartilages."—*Gant*.

Professor Williams, in his work on "The Principles and Practice of Veterinary Surgery," observes concerning chronic scrofulous synovitis: "This affection is, within my experience, confined to horned cattle, where the process of 'in-and-in' breeding has been carried out to too great an extent. The joints most usually affected are the elbow and stifle, and the foot-joints in the disease called 'foul-in-the-foot.' It attacks animals of all ages, but generally they are three years old and upwards.

"At the outset, it is difficult of diagnosis, the symptoms being a lameness arising from no apparent cause, without swelling, or any indication of pain other than the lameness; but after a time, a slight swelling appears about the joint affected, without heat, or much pain upon pressure. The swelling gradually enlarges; is of

a doughy, elastic nature; the limb below it seems to waste; the animal begins to lose condition, the lameness and pain increase, and suppuration may take place.

"The suppuration, however, is by no means a constant result, the disease becoming arrested by ankylosis of the joint.

"In some cases, constitutional symptoms of scrofula may precede the manifestation of the joint disease; when this is the case the diagnosis will be rendered easy, and the practitioner need not hesitate to condemn the animal to slaughter.

"*Pathological Anatomy.*—The structures around the joint will be found infiltrated in circumscribed spots with a yellowish-white, lardaceous, solid material (tubercle), and the synovial membrane studded upon its surface with yellowish-white globular bodies, which, when cut into, present the same tubercular character. These bodies vary from the size of a turnip-seed to that of a large pea.

"The membrane itself is of a greyish-white colour and gelatinous in appearance, its vessels in some parts being highly injected, the synovial fluid curdy and more opaque than natural; the cartilages of incrustation, as well as the ends of the bones removed by ulceration, causing the interior of the joint to present a worm-eaten appearance. In the interior of the bones round spots of tubercular matter are seen deposited in the cancelli.

"In dissecting the various structures it will be found that the skin, the subcutaneous tissues, and synovial membrane are matted together into an almost inseparable mass.

"*The causes* are, as already indicated, constitutional, and whenever scrofula in any of its forms makes its appearance in a herd, it will be high time to infuse new blood into it. Exceptional cases may, however, arise from neglect or other debilitating influences, but these are rare.

"The treatment can be but palliative, the preparation of the animal for the butcher being the only cure to be gained.* The application of blisters to the part will often remove the inflammation which is consequent upon the pressure of the tubercular matter for a brief period, and thus allow the animal to put on fat.

"The patient must be stall-fed, kept as quiet as possible, and have food of the most fattening nature; cod-liver oil may be given night and morning. If the disease has made much progress before

* A very questionable one.—J. W. H.

the practitioner is called in, or if, in spite of the treatment recommended, it continues to advance, the animal had better be put out of its suffering."

GLANDERS.

Glanders in the ox is of extremely rare occurrence, and when produced (a difficult matter) is the result of inoculation. It is scarcely necessary to discuss the subject in this work; suffice it to say, the symptoms are allied to those observed in the horse, and destruction is the only course to adopt.

PYÆMIA.

Pyæmia or pyohæmia—from *πύον*, pus; *αἷμα*, blood—signifies blood-poisoning due to the absorption of ichorous or putrid matters, attended with the formation of secondary abscesses. Shivering, profuse perspirations, quick small pulse, cerebral disturbance, diarrhœa, dysentery, and rapid emaciation are among the prominent symptoms of blood-poisoning. In the human subject a sweet hay-like odour of the breath is present.

Treatment.—Medicinally, aperients, stimulants, antiseptics, tonics. Externally, incisions, bleeding, fomentations, poultices.

ABSCESS.

Cattle are especially liable to the formation of abscesses, frequently multiple.

An *abscess* signifies an encysted collection of pus, i.e. a quantity of matter, the result of dead, disintegrated, and dissolved textures, enclosed in a newly-formed cyst or capsule.

An abscess may be external or internal, acute or chronic. External abscess may exist on any portion of the body, and be superficial or deep-seated.

Internal abscesses are frequently associated with a phthisical or scrofulous diathesis, hence *pneumonic*, *hepatic*, and *mesenteric* abscesses.

Or they may exist independently of such diatheses, and arise from acute inflammatory diseases, blood-poisoning, wounds, etc., and any of the internal organs become the seat of their formation.

Glandular structures are especially liable to abscess, and from the complexity of the bloodvessels surrounding them, this is not to

be wondered at. Abscess "may be named *acute* or *subacute*, with reference to its more or less speedy formation; sometimes also termed a *hot* or a *phlegmonous* abscess, as having regard to the sthenic character of the inflammation, or the firmly circumscribed boundary of solid lymph. A common boil is a good example of this form of abscess. It is the opposite condition of what has been termed *diffuse* abscess, which is nothing more than diffused suppuration.

"The circumferential lymph of this pus-containing cavity becomes highly organized by the development of capillary blood-vessels having a looped arrangement (Fig. 134); and it assumes somewhat the structure and characters of mucous membrane, and acquires a secretory power. It becomes pus-forming, as well as pus-containing; it is a *pyogenic* membrane; and as it absorbs old

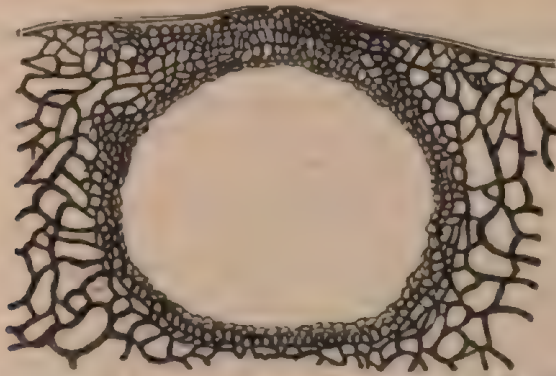


Fig. 134.—Section of Abscess.—*Paget*. Development of Capillary Blood-vessels having a looped arrangement in the circumferential lymph of a pus-containing cavity.—*Gant*.

pus as well as secretes new matter, the abscess is gradually concocted, or ripens."—*Gant*.

Symptoms.—The early symptoms of external abscess are pain, heat, redness, and swelling. As the formation proceeds, the enlargement becomes more or less oedematous on its surface, owing to the exudation of serum external to and surrounding the cyst, and this causes it to pit or leave an indentation on pressure.

The abscess enlarges as it develops, the pain increases, and throbbing or "jumping" is felt by placing the fingers over the part. The gradual and continued pressure of the increasing accumulation of fluid occasions absorption of the parts pressed upon, though not in an equal direction, but usually towards the external surface and

at the most favourable point. As the pus approaches the latter, fluctuation is perceived, the surrounding parts become glazed and discoloured, while the point to which the matter is tending for exit becomes thin and colourless, and ultimately the stretched skin, being no longer able to resist the pressure, sloughs, and an irregular aperture is formed, through which the pus is discharged.

Treatment.—The primary treatment of abscess consists in encouraging a speedy formation of pus, and this is usually effected by the application of poultices, hot fomentations, or stimulating liniments.

When the abscess is matured, which may be known by the symptoms alluded to in its latter stage of development, evacuation by incision should at once take place. A poultice may afterwards be applied if in a convenient situation, or the sac syringed out with tepid water.

The customary practice of squeezing, beyond what is absolutely necessary, is strongly objectionable; it increases the inflammatory condition of the part, and inflicts additional and unnecessary torture on the patient. It is advisable, to prevent secondary abscess, that the incision be kept open for a few days by the insertion of a pledget of lint or tow, or the injection of a little stimulating liniment.

Usually, more or less febrile disturbance accompanies the formation of acute abscess, and it is advisable, therefore, at the onset, to administer a mild aperient. Again, it must be borne in mind that abscesses, especially if they are of any magnitude, or diffused, as is generally the case in cattle, are exceedingly debilitating—full support in the shape of nourishing food and tonics (iron) is thus indicated.

Chronic abscess is comparatively slow in development, and is usually seen in old animals, and those of feeble or weak constitution. Such abscesses are generally large and deep-seated, and are attended with considerable emaciation.

Treatment.—Evacuation by incision, as in the acute form, is, if practicable, decidedly advisable. Where, however, the situation renders opening dangerous, and the abscess is small, discussion should be attempted by the application of a stimulant to absorption over the part, and the administration of a similar agent internally. The tincture of iodine for the former, and the iodide of potassium for the latter, are the agents most frequently and beneficially used.

Attention to the general condition of the system, especially to

the secretions, is also necessary. The food should be plain, wholesome and nutritious.

Internal abscess can rarely be treated by surgical means. The symptoms are usually discovered, if in the lungs, by auscultation, nasal discharge, and the nature of the expectoration; if in the uterus, by the discharge of pus per vaginam associated with other symptoms mentioned under this head; if in the kidney, by heat and pain over the loins and difficulty in voiding urine, which is at times mingled with pus, together with other abscess indications already named in this renal affection.

The symptoms of hepatic abscess are extremely obscure; the usual manifestations of deranged liver are invariably present, and there is excessive pain on applying pressure to the right side, which the animal avoids lying on.

Abscess by *translation* is that condition where the pus, unable to find its way to the surface, travels to other parts. As differing from ordinary abscess, a fluctuating swelling is present, unattended by heat, redness, and pain.

TUMOURS.

Various forms of tumour or morbid growth are met with in bovine practice. Such bodies may be superficial or deep-seated, external or internal, and are divided into *malignant* and *non-malignant* or *innocent* tumours.

Malignant Tumours.—In this class are included *cancer* or *carcinomata* and its varieties. These are: *encephaloid*, *scirrhus*, *colloid*, *cystic*, *epithelial*. The various forms of encephaloid cancer are known as *villous*, *melanotic*, *fungus hæmatodes*.

Non-malignant tumours comprise: simple sarcoma, the fibrous, fatty, simple cystic, or cysto-sarcoma, cartilaginous, calcareous, and scrofulous tumours.

Cancer may be due to *constitutional* tendency, or may be primarily local and secondarily constitutional. Thus local irritation or injury will give rise to cancer in the ox, and is probably, as affecting the mouth, most frequently attributable to that cause.

In the earlier stages of cancer the general health is not perceptibly affected; but as the disease advances and the lymphatics and glands become involved, then cachexy takes place.

In the various forms of cancer met with in the bovine species we most frequently observe the encephaloid or cell-abounding cancer, with its characteristic milk or creamlike juice; the scirrhus or hard cancer, of a fibrous nature and with but little exudation, and that of a granular or gruel-like consistency; the colloid or gelatinous cancer, also known as alveolar, cystic, or gum-cancer; hæmatoid cancer, or fungus hæmatodes (see "Diseases of the Eye"); melanoid, or black cancer; epithelial cancer.

An interesting case of the latter description recently came under my notice. The animal was a valuable three-year-old prize Devon bullock, the property of the Earl of Dartmouth. On the 29th Dec. I was consulted with regard to a swelling on the right cheek. An



Fig. 135.—Head of Bullock : *a*, external appearance of right cheek at seat of cancer.—*Original*.

examination of the mouth revealed three cancerous growths; the large one causing the external protuberance was attached to the superior maxilla, commencing immediately in front of the first molar, spreading some distance across the roof of the mouth, displacing the two first molars, and extending posteriorly to the 3rd molar. This cancer was of a livid mulberry appearance, having an irregular flattened surface. The other two occupied positions on the superior edge of the lower maxilla, midway between the first molar and corner incisor, and were about an inch apart. Each was about the size of a walnut, smooth, glistening, and purple, with a bleeding inner surface from friction of the tongue.

The beast had neither failed in appetite nor condition, and was to an ordinary observer in other respects healthy, but an occasional cough drew my attention to the condition of the lungs. Auscultation revealed rough breathing and absence of thoracic murmur over various parts of the lung surface, and corresponding deadness followed percussion. This examination resulted in my expressing an opinion that tuberculosis co-existed with cancer, with an accordingly unfavourable prognosis. Temporary treatment, pending the decision of his lordship, consisted in the application of iodine to

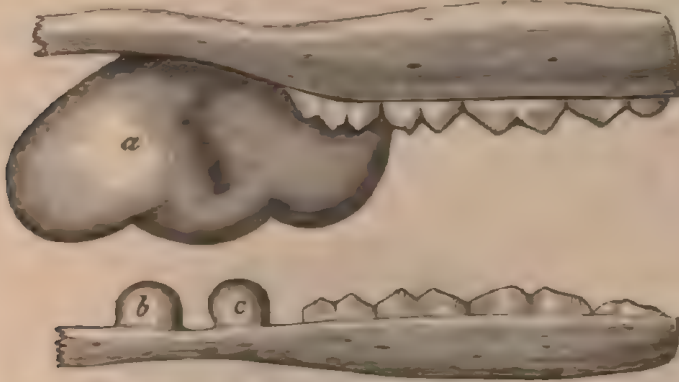


Fig. 136.—Portions of the upper and lower jaw of Bullock : *a*, *b*, *c*, cancers.—*Original*.

the cheek externally, and the tincture of perchloride of iron to the surfaces of the cancers internally. Mineral tonics and medicinal agents, suitable for the chest complication, were also prescribed. The first molar, which was evidently a source of irritation, was removed at once, and disease was found to exist in the fangs.

Ten weeks afterwards the animal was slaughtered, the head, lungs, and liver being forwarded for my examination. The cancers have already been described. At the root of the right lung an enormous double cyst existed, containing more than a quart of creamy fluid and weighing between eight and nine pounds. Both lungs were loaded with tubercle in various stages. The liver was equally involved, containing in addition abscesses, rendering it a matter of some surprise that the existence of such extensive disease should have in no way reduced the magnificent condition of the animal, beyond a loss during the last fortnight of eighteen pounds; and this latter might be attributed to the daily dressing of the mouth, as when not applied the animal fed better.

Figs. 135 and 136 illustrate the case.

The treatment of the various kinds of tumour mentioned consists in removal either by excision, ligature, *ecraseur*,* or caustics. Such measures in the ox, however, as regards cancer, are not satisfactory, and from the tendency of the disease to recur, and owing to its nature the flesh being decidedly unfit for human food, absolute destruction of the animal should be advised.

NÆVUS.

Under the heading of tumours a special, and in the bovine species exceptional, form of morbid growth is met with, termed "nævus." This may be described as a lobulated vascular body (*nævi vasculosi*, or *arterial nævus*) composed of enlarged, tortuous capillary vessels, veins, or arteries; in other words, it is an *aneurism* by *anastomosis*. The *venous* or *erectile* form, composed of a con-

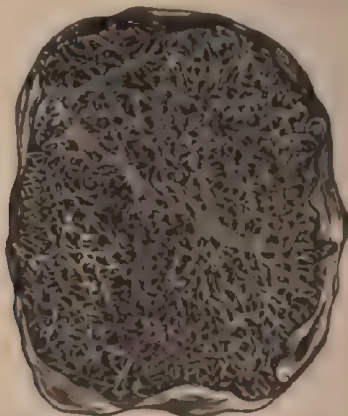


Fig. 137.—Section of an Erectile or Vascular Tumour, showing the fibrous trabecular structure and investing capsule (Museum of the Royal College of Surgeons, England, drawn one third larger than the specimen).—*Hunter*.

glomeration of enlarged veins imbedded in a network of fibrous tissue, is uncommon in the ox (Fig. 137).

Nævi may exist on various parts of the body, head, neck, or face. Such growths are usually congenital—termed commonly, in

* The *ecraseur* designed by Mr. W. H. Beach, M.R.C.V.S., is an excellently adapted instrument for the removal of tumours, and from its easy manipulation and carefully regulated action is especially useful in confined situations.

the human subject, "Mother's marks." They also may be single or multiple.

Nævi are more or less pulsating, arterial ones obviously so. In appearance they are irregular, flattened, and of a deep purple colour; they are usually raised above the skin, similar to a wart. On manipulation they are spongy, compressible, and painless.

"*Aneurism by anastomosis* consists of enlarged, elongated, tortuous, and perhaps convoluted arterial vessels, which freely communicate. The tumour or swelling has an ill-defined outline, and presents, when near the surface, a flattened but irregular aspect, corresponding to the eel-like arteries; and its distinctive character as a vascular tumour is its strong pulsations. This species of vascular growth is situated, most commonly, in the subcutaneous or the submucous cellular tissue; especially of the scalp, face, neck, or the orbit, and occasionally of the tongue. Or the tumour may be deep-seated, as in muscle or bone."—*Gant*.

This kind of tumour is not congenital, according to the above authority, but commences usually in youth, and is sometimes referable to a blow or injury of the part affected.

Treatment.—This consists in inducing absorption by compression; the application of lunar caustic, or nitric acid, cauterization, excision, or ligature. When the nævus is small, its destruction may be effected by *adhesive inflammation*.

The following interesting case of bovine nævus is recorded by Lancelot T. Barker, M.R.C.V.S., in the *Veterinary Journal*, April 1877:

"On the 17th of last January, I was called to see a white milch-cow, the property of Mr. Ralph Agar, of Sparrow Park Farm, Marske-by-the-Sea, the messenger stating that the animal had broken a bloodvessel. On arrival I found the cow in an anæmic condition, with the visible mucous membranes blanched, and great debility present. My attention was directed to a fungoid-looking wound in the skin, about midway between the anterior spinous process of the ileum and the tuberosity of the ischium. At the first glance I thought it was a large wart or "angleberry," it being slightly raised above the cuticle; but on closer inspection I discovered it to be an indurated, circular, subdermic tumour. I therefore removed the clot of blood that covered its surface, considering it to be a *nævus*, or vascular tumour. No sooner was

this done than a jerking stream of arterial blood squirted with great force across the stall. I was informed that it had frequently done so before, but on each occasion the hæmorrhage had ceased spontaneously—though the cow was every time very much reduced in strength and condition.

"As a remedial measure, I inserted two long straight pins deeply through the skin—one crossing the other at right-angles at the centre of the spot; a piece of cord was twisted round the pins, so as to strangle the skin occupied by the bleeding formation, and this arrested the hæmorrhage. On further examination, I found several nævi on the opposite side of the body; these varied in size, and on removing the clot from those which had bled, and the epidermis from those which had not, streams of arterial blood jerked out of each.

"I applied a little of the solution of perchloride of iron to these hæmorrhagic patches, and prescribed tonics, with a liberal diet; at the same time the cow wore a 'cradle' on her neck, to prevent her licking the parts.

"This treatment appears to have been successful, as the animal now feeds well, and has greatly improved."

PAROTITIS.

Parotitis, commonly known in the human subject as "mumps," is occasionally observed in cattle. It consists in inflammation of the parotid gland, the salivary glands being frequently involved. The disease is of a specific nature, and contagious. Young and feeding stock are most liable to its invasion.

Symptoms.—Sore throat, pain in mastication and swallowing, difficult breathing, fever, tenderness and swelling in the parotid region, generally confined to one side, but rarely suppurative. Frequently a permanent induration of the gland results, which gives rise to obstructed breathing and excites coughing.

Treatment.—The administration of a saline aperient, diffusible stimulants, and light sloppy diet. Externally, hot fomentations, or linseed poultices. In chronic cases, the application of iodine, biniodide of mercury, or cantharidine blister. In threatened asphyxia, tracheotomy.

CHAPTER XXIV.

ACCIDENTS AND OPERATIONS.

Fractures.—Dislocations.—Phlebotomy.—Wounds.—Sprains.—Injury to Stifle Joint.—Tracheotomy.—Esophagotomy.—Lithotomy.—Lithotrity.—Hernia.—Rumenotomy.—Gastro-hysterotomy.—Castration.—Spaying.—Sore Feet.—Overgrowth of Claws.—Foul.—Amputation.—Dishorning.—Veining.—Vaccination.

FRACTURES.

By fracture is meant a solution of continuity in the bony structure. They are divided into *compound*, *comminuted*, and *simple*. *Compound* when there is an external wound communicating with the fracture; *comminuted* when the bone is broken into numerous fragments; *simple* when the bone is broken only in one place, and without other injury. The latter may be *transverse* or *longitudinal*. In young animals, partial or incomplete fracture, *i.e.* when the outside of the bone splits away similar to a tough twig when bent to break, is occasionally met with (Fig. 138). This, in human surgery, is termed green-stick fracture.



Fig. 138.—Incomplete Fracture.—*Original*.

Fracture without separation is when a bone is starred, as it were, and held together by the periosteum.

The long bones are those most liable to fracture, more especially those of the extremities. Fracture of the scapula, pelvis, ribs, cranium, and vertebrae are occasionally met with in cattle, and therefore demand notice in these pages.

In the human being there are various predisposing causes of fracture.* In the ox they are invariably the result of direct

* "Fracture is produced in general by external force suddenly applied, either directly to the part, or indirectly at a distance; but occasionally it

violence. The usual symptoms of limb-fracture are deformity, loss of muscular power, pain, swelling, and crepitus.

The reparative process in the lower animals, especially the dog, is remarkably rapid, and in many instances when the parts are placed *in situ*, and the splints applied, the animal seems to understand the injured limb is not to be interfered with, and is content to remain quiet.

Reparation.—The union of fractured bone is wonderfully and beautifully accomplished, and often marvellously correct in cases where artificial aid has not been rendered.* The increased strength

is the sudden and powerful action of muscles, as in fracture of the patella not unfrequently. *Predisposing* causes are numerous and very influential. Some relate to the functional uses of the bone: thus, the radius is liable to fracture in the manifold use of the hand; others are anatomical predisposing conditions, as the exposed position of a bone—the tibia, for example—and brittleness of the osseous texture, as a condition consequent on age. Separation of an epiphysis, as at the lower end of the humerus, is a species of fracture incident to youth. Certain blood-diseases also apparently have some predisposing influence in the production of fracture: rickets, syphilis, cancer, scrofula, and scurvy.—*Science and Practice of Surgery. Gant*, vol. i. p. 581.

* Spence says: "In simple fractures, as a rule, the injury is caused by the lowest degree of violence; if the fracture be caused by indirect violence, as by jumping or falling, the injury is at its minimum.

"Here there is pain and distortion, with a certain amount of swelling if the limb be not speedily adjusted, and crepitus on moving the broken ends of the bone. If such a fracture be left alone, or if the fractured ends of the bone be left without any retentive apparatus, or without being reduced, as in experiments on the lower animals, we see what nature will do to cure the fracture. For a time the movement of the broken fragments gives rise to irritation and spasm, and leads to increased pain and suffering. More swelling takes place, because the broken ends of the bone tear the blood-vessels, and blood is effused, and then serous exudation follows. The movements of the muscles become somewhat obstructed by this swelling, and thus a certain amount of rest is, as it were, enforced. The ends of the bone generally lie at some little distance from each other, with the periosteum torn, and the Haversian structure connecting the periosteum with the interior of the bone also partly torn, and we find a certain amount of bleeding taking place into it. The ends of the bone override or overlap each other, and a large mass of blood is formed round them. A considerable amount of effusion takes place, and plastic material is exuded from the vessels of the Haversian structure, so that after a time a hardened mass surrounds the fracture and keeps the parts somewhat together. This mass is called the 'provisional callus,' and some believe that it is present in all cases of fracture, and is absolutely necessary to union. They hold that this mass becomes converted into fibrin, which is afterwards ossified, and that so the effused blood-clot comes to be useful in forming bone. My answer

of the reunited part is also immense, as though Nature had intended no such injury should again at that particular site take place.

to this is, that in a properly set fracture, and one which has been set at once, there is no such provisional callus, and therefore it cannot be essential to the healing of the fracture. The parts are simply brought together; plastic material is thrown out from the Haversian structure, and from the periosteal vessels, and this becomes ossified; but the simple fibrin of the blood-clot is never of any use, and is to be regarded merely as a foreign body, the less of which we have the better. Those who hold the former view say that the large osseous mass formed makes the bone stronger than ever. In such instances, however, it will be found that the apparent thickening of the bone at the point of union is really due to overlapping of the fractured ends, and the new material is thrown out only to fill up the inequalities.

"In a properly set fracture, I repeat, there ought to be little swelling, and no provisional callus. The union of the bone takes place just as in the soft parts, from the plastic material thrown out between the opposed surfaces. What we see in the case of a fracture in the lower animals, in experiments made on them, is simply the natural process of cure. The blood effused is of use in preventing the action of the muscles, which would otherwise cause further displacement; but the clot is of no use in forming new bone. Some hold that the union of the ends of the bone is due to the clot of blood thrown out between them becoming ossified. They say that the medullary canal becomes re-established, and the circulation is again carried on through it, so that, excepting the thickening at the fractured point, we could tell no alteration in the bone. If, however, we look at a fractured bone, no matter how long after the injury, we see that the medullary canal is never re-established, but that at the fractured point there is always a septum, a line of dense bone, which can in all cases be recognised; the Haversian structure has become condensed and ossified at the fractured point, where the new material was thrown out between the ends of the broken bone.

"The considerations are important practically, for if we trust to the provisional callus and a certain amount of swelling being present in all cases, we are very apt to have badly set and imperfectly united fractures. If, on the contrary, we treat the fracture as we do a wound, by keeping the ends of the bone in accurate contact—a slight amount of new matter only being thrown out to unite the bone—we will have well-set and firmly united fractures. The fracture should be set at once, and the fragments kept in position by proper retentive apparatus, and means taken to modify any inflammatory action which may arise.

"The reduction of a fracture consists in making extension and counter-extension on the lower and upper parts of the bone, if the ends of the bone are overlapping, until the broken ends of the bone come into contact. Coaptation is the exact fitting of the broken surfaces to each other. When this is effected, the fragments must be kept in position by means of retentive apparatus. In applying this, we must keep in mind to fix the neighbouring articulations as well as the broken ends of the bone, so that no movement can be made which would affect the fractured point. The mechanical retentive apparatus is generally very simple, consisting usually

There are various opinions, however, regarding this extra deposit of bone. It will be observed in the foot-note that Spence says, "the apparent thickening of the bone at the point of union is really due to overlapping of the fractured ends, and the new material is thrown out only to fill up the inequalities"—in other words, to render a smooth surface. My own experience of fractures in the lower animals does not altogether bear out this view, an amount of callus or extra bone-deposit being seen in fractures set most perfectly; even in transverse ones evenly set a ring of new bone is apparent around the seat of fracture, and this has not been absorbed by time. Absorption, however, of this provisional mass does to an extent take place in the lower animals; and the shortness of their life and early maturity compared with human life may account for it not disappearing to the same degree as in the latter. If, again, the new bone is *true* bone, which the microscope proves it to be, then the theory of "once bone always bone," and the impossibility of absorbing bony deposits, as splints and spavins, explodes. Certainly, a splint cannot be termed a provisional callus, nor yet can a spavin; nevertheless, both are bone, and, if not of the same type, should, by reason of the same argument, be amenable to treatment by absorption; and undoubtedly they are.

With regard to the period at which union is complete, much depends upon the seat of fracture, its nature, the age of the animal, and its constitutional state. In animals under six months old, union of a fractured long bone may be completely established in four weeks. In older ones it may vary from six to eight weeks. During calfhood a limb fracture will unite in ten days or a fortnight under favourable circumstances.

of a wooden or pasteboard splint on either side of the limb, passing from the joint immediately above the fracture to that immediately below it, and retained by slip-knots or a bandage, so as to fix the limb completely. In other cases a pad in certain places is necessary, to prevent the bone being drawn in towards the trunk.

"In treating a fracture, whether by retentive apparatus, such as splints or bandages, or by attention to the position of the limb, it is most important always to keep in mind what are the displacing causes of the fracture; what are the conditions, whether muscular or otherwise, which led to the displacement originally, which tend to displace the bone after it has been set, and which, therefore, require to be obviated. Without attending to these points we can never treat a fracture on principle."—*Lecture on Surgery. James Spence, F.R.S.E.*

The treatment of fracture consists in reducing the separated portions to their proper position and maintaining them there, when so reduced, by the application of splints and bandages. Splints may be composed of wood, pasteboard, leather, or gutta-percha. The three first-named are retained in position by bandaging; the latter is rendered soft with hot water, and moulded to the limb. Bandages take the place of splints when soaked in gum, starch, or plaster of Paris.

With regard to fracture of the long bones of the limbs, I have found no application equal to the wooden splint. We will suppose a case of fracture of the metacarpal. The fractured edges being reduced to their relative position, and the limb held firmly in a straight line downwards, a bandage is wound moderately tight around the member, the splints, cut the length and breadth required (I always take them to the bottom of the foot), are then applied as follows: one in front, one behind, and one on either side. The surface is smeared with pitch to maintain them better in position; and it is on this account, to prevent irritation and detachment of hair, that I advise in the first instance a bandage. A pad of tow, cotton-wool, or wadding should be placed under the ends of the splints, to prevent irritation and wounds. Being thus satisfactorily arranged, a narrow bandage of calico is wound round firmly from end to end, smeared occasionally in its course with pitch. This done, the patient should remain undisturbed; and to prevent risk, it is better to place a cradle on for the first few days, or at all events until the parts have become firm. With calves no such precaution is necessary.

Fractures of the Cranium, Vertebrae, Scapula, Pelvis, or Femur are seldom advisable cases for treatment in cattle, and the same will most frequently apply when joints are complicated.

Fracture of the Ribs is usually the result of external violence, as blows, kicks, or crushing. The posterior ribs, which are most prominent, are those most liable to fracture, especially by crushing. Rib-fracture is generally transverse, but sometimes oblique; whilst the displacement may be outwards or inwards, usually the latter.

The symptoms are painful, catching respiration, ultimately becoming abdominal; subcutaneous emphysema; pain on moving the animal, and crepitus when so doing, which may also be felt by placing the hand flat over the seat of injury during movement or coughing.

The treatment consists in applying a broad bandage firmly round the chest so as to prevent the animal dilating the thoracic walls in breathing. A portion of leather or gutta-percha cut the required size placed immediately over the fracture, and secured in position by means of a surcingle buckled firmly round, makes an admirable contrivance in the ox. To keep this in its proper place it may be necessary to attach a collar, side-straps, and crupper, similar to the appliance used in umbilical hernia.

If the fracture be a compound one, and the end of the rib penetrate the cavity of the chest, it is advisable that the ingress of air should be prevented as much as possible; and the patient must be treated anti-phlogistically. Perfect quietude is absolutely necessary. In the event of pneumonia or pleurisy resulting, the treatment appropriate for those diseases must be employed.

Compound Fracture is more frequently met with in the long bones of the limbs. If the end of the bone protrude through the opening, and from the smallness of the latter replacement is difficult, either the protruded bone must be removed with a saw or bone-nippers, or the wound enlarged. When comminution is also present, any completely detached fragments of bone should be removed, otherwise they will act as foreign bodies, create inflammation and suppuration, and prevent the healing process. In the application of splints, it will be necessary to arrange them so that the wound may be readily exposed when requisite. Antiseptic treatment should be applied to the latter, which may be fulfilled by carbolized dressings, and a pad of lint to exclude the air.

Fracture with Luxation.—When fracture occurs with dislocation, the treatment is doubly difficult, as the dislocation must first be reduced—this, under the circumstances, is no easy task—and then the fracture is to be attended to. Occasionally it will be found necessary to have recourse to the latter first, in order to permit the extension required to reduce the dislocation; after which it is generally advisable to reset the fracture, owing to the unavoidable displacement consequent on the operation. The after-treatment of fracture is very simple. Quietude, and attention to the bowels and diet, are the points mainly to be observed. The bowels should be kept gently relaxed; this is especially needful in fracture of the hind extremities, and particularly the pelvis, as the animal in placing himself in a position for fecal evacuation is apt, in the

strain and weight almost necessarily thrown on the injured part, to displace the fracture. The diet should be plain, unstimulating, and relaxing. When an excessive amount of swelling takes place above or below the splints, a relaxation of the pressure is indicated, which may be accomplished by slitting up the bandages a little distance between the splints.

False Joint.—When a fracture fails to unite by osseous matter, and a fibrous connection is substituted, what is termed *false joint* is established. In the long bones, treatment is more easily and satisfactorily adopted than in other situations. When it is found on the removal of the support that osseous union has not taken place, the limb should be again fastened up, more firmly if possible, than before, a liberal diet allowed, and tonics administered. If at the expiration of eight or nine weeks the false joint still exists, and there appears no prospect of its being otherwise unless different measures are adopted, inflammatory action is to be established in the false union with the object of exciting the formation of osseous material; and this may be done by piercing the structure in various places with a sharp needle, and moving the imbedded point about in different directions until it is considered that sufficient irritation has been produced. The limb is then to be bound up as before.

Certain constitutional conditions of an animal have a tendency to retard the formation of a new bone (scrofula or rickets). In such diathesis, mineral tonics and bone-making materials should be freely administered. Pregnancy occasionally exercises a preventive influence, and calls for similar treatment.

Fracture of the Horns.—This is a very common accident. The horn may alone be fractured, or both horn and core. When the latter occurs, considerable hæmorrhage takes place, necessitating prompt suppressive measures. Sometimes the horn is torn off without fracture, leaving the naked sensitive core exposed. Not unfrequently the bone is fractured, exposing the opening into the frontal sinuses. In simple fracture of the horn nature will effect a cure. If, however, the core is fractured, the part should be dressed with the tincture of perchloride of iron, and a tar bandage immediately applied. In fracture of the bone of the horn the opening into the frontal sinuses must be closed as speedily as possible with successive layers of tarred cloth, so that every possible chance of

the entrance of air may be guarded against. Where the bone is not only fractured, but completely separated, the horn should be removed with a saw below the fracture, the cautery applied, and the part allowed to heal and become covered by an extension of cuticle.

Fracture of the Larynx.—Fracture of the laryngeal cartilages is generally the result of injury. Old animals, whose cartilages are less yielding than in youth, are most liable to this accident. Considerable irritation, and occasionally threatened asphyxia, follow laryngeal fracture. Hot fomentation should be employed to allay inflammatory symptoms, and in the event of impending suffocation tracheotomy is indicated. Union of the fracture is usually self-accomplished, but for some time afterwards considerable tumefaction exists in the region, and it is advisable to apply a blister or preparations of iodine. The animal should on no account be fastened with a tie-chain.

DISLOCATIONS.

Dislocation, luxation, or the displacement of a joint without fracture, is not of very common occurrence in cattle. The form



Fig. 139.—Dislocation of the Patella.—*Armatage*.

most frequently met with is displacement of the patella, which may be due to a relaxed condition of the ligaments, or from external force. The dislocation is usually outward and a deep

depression is apparent at the front of the joint in the site which the patella should occupy; there is an inability to flex the joint, and as a consequence the limb is dragged afterwards. Reduction



Fig. 140.—Mode of securing the Hind-leg to prevent recurrence of Dislocation of the Patella.—*Armatage*.

is effected by drawing the limb forward, which is best performed with a cord round the foot passed through a collar or rope on the neck. When fully drawn forward, the thigh should be drawn outwards at the same time, the patella being pushed inwards. It is advisable to keep the limb in the position described for a few hours after reduction (Figs. 140).—*Armatage*.

Dislocation of the fetlock is occasionally met with in cattle. The treatment consists in powerful traction on the foot, an opposing force being brought to bear below the knee immediately above the dislocation, and pressure on the displaced joint in the direction required. I deem it advisable, after reduction, to apply splints for ten days or a fortnight, as a supportive and preventive measure.

PHLEBOTOMY.

Phlebotomy, venesection, or bleeding, is an operation requiring little notice in these pages. Happily the days of blood-letting have nearly passed away, and what was once a rage has now become a rarity. The site usually selected for the abstraction of blood is the neck, in the channel of the jugular vein. From the size of this vessel, its easy distention and convenient position, a greater volume and more rapid flow of blood is obtained than elsewhere. The

modus operandi is the placing of a tight ligature round the lower part of the neck, causing the vein to enlarge and make itself sufficiently prominent to be struck with the fleam, or punctured with a lance. When sufficient blood has been obtained the cord is slackened, the external wound immediately closed by passing a pin through each lip, and winding round it figure-8-wise some unplatted twine or tow; the point of the pin should then be cut off. In two or three days, if not removed by the animal, it may be drawn out, or left to its own course.

WOUNDS.

The four kinds of wounds commonly met with in cattle are: *incised, lacerated, punctured, and contused.*

Incised wounds are clean cut, like those produced in surgical operations, or from sharp-edged substances.

Lacerated are those in which the tissues are torn asunder.

Punctured, those produced by stabs or pricks.

Contused, by bruising or crushing.

To repair a wound, it is necessary that a process of what is termed "healing" should be gone through, and this process is accomplished in one of the following ways:

A. *First intention*; i.e., immediate re-union of the parts, without the formation of new material (a very questionable process).

B. *Adhesive inflammation*; or the exudation of lymph on both cut surfaces.

C. *Granulation*; or the formation of small masses of new flesh, over which a secretion of pus is continually poured.

D. *Scabbing or crusting*; a covering formed by nature of dried exuded matter on the raw surface, as pus, blood, or lymph, mingled generally with dirt or dust.

The final result of either process is a scar or cicatrix, varying in character and dimensions according to the method by which the wound is healed. In our hairy-coated patients, this is not of so much moment as it is on uncovered human skin.

Incised wounds are generally most amenable to treatment. In those recently inflicted it is always advisable, if possible (unless there are diseased deep-seated structures), to obtain union by the first intention, or, more properly speaking, by adhesions. To

effect this, after the wound has been cleansed and the hæmorrhage has ceased, the lips are brought into direct opposition (taking care no hairs get between), and so maintained by sutures or plaster; the latter will necessitate shaving off the hair before it can be applied. Care must be taken to prevent the animal interfering with the part, otherwise it can only heal, if re-opened, by granulation. The result is a broad, unsightly cicatrix, instead of the fine, and, in time, almost imperceptible seam left from union in the first instance by direct opposition, with or without the first intention.

I say, with or without the first intention, because it is not unusual for the veterinarian to be asked to reclose a wound through the lips of which the sutures inserted some four or five days previously have burst. This is seldom necessary, as, if the lips of a wound in the lower animals can be kept in opposition for the first four or five days, they will, if they then break away, resume in the final healing process the position they were originally placed in, and each suture-mark will reveal the nicety or otherwise of adjustment.

The same remarks will apply to healing by adhesive inflammation,* which may be considered a kind of, if not really, first intention.

The sutures commonly used are soft wire, pins, twine, silk, and catgut. The latter carbolized are more especially adapted to wounds of the viscera or abdominal walls.

Granulation and scabbing are, however, the most common methods of healing in veterinary practice. When the secretion of pus takes place, its character should be examined to ascertain if it is healthy—i.e. of a creamy consistency, yellowish-white, of a peculiar indescribable odour, not disagreeable or unhealthy, being ichorous or curdled, of a dirty colour, and fetid. Suppurating wounds require to be cleansed with tepid water at least once daily. The following liniment occasionally injected will promote a healthy discharge:

Acid Carbolic	1 drachm.
Ol. Terebinth.....	1 ounce.
Ol. Olive	6 ounces.

* It is very doubtful if healing ever takes place without an exudation of lymph, at all events in the lower animals.

Where the granulations spring up too rapidly, forming what is termed "proud flesh," the application of lunar caustic is necessary; but it should be borne in mind that a twofold effect follows its use viz., a destruction of the present flesh (that which it comes in contact with), and a stimulus to growth of the future tissue. Sluggish wounds, therefore, that are occasionally treated with caustic, granulate much more rapidly than under any other treatment.

In healing by granulation, care should always be taken that the wound heals from the bottom; otherwise the confined pus will burrow, and deep-seated abscess or sinuses be the result. This is particularly to be observed in punctured wounds.

Lacerated wounds must of necessity heal by granulation. In the first instance, the wound should be cleansed from clots and any foreign matters. If there is excessive hæmorrhage, it will be necessary to secure the vessel, if possible, by ligature, or pack the wound with a portion of sponge or tow saturated with some astringent, as solution of alum or tincture of iron. This may be removed in twenty-four hours, and if no secondary hæmorrhage occurs, the stimulating liniment before advised may be injected, and the same treatment followed as is given in wounds healing by granulation.

When no skin is removed, the edges should be brought together with sutures, and so maintained as long as possible, taking care to leave a free passage for the discharge of pus. If the sutures are tied in bows, they can be easily unfastened, or, in the case of wire, untwisted, for the withdrawal of the packing, and reclosed.

Lacerated wounds from dog-bites should be freely cauterized.

Punctured wounds are generally very troublesome; they may be called deceptive wounds, for sometimes it is impossible to tell to what extent they go, or what foreign matters may be left behind; thorns, for instance, or the rust off a spike or nail, may, from remaining unextracted, produce pyæmia and death. Such wounds, then, should always be carefully examined, and the probe is only a safe explorer in the hands of a professional man. As the orifice is frequently exceedingly small, the hair around it should be cut off, so that it may not become matted and form an obstruction to the discharge of pus; this will also facilitate the daily examination and treatment of the wound. If the puncture be in the foot, and there is reason to suppose a stub or rusty nail has produced it, a poultice

is advisable, and the insertion occasionally of a little caustic. It should never be allowed to heal unless the attendant is satisfied it is sound at the bottom; otherwise, as before observed, deep-seated abscess and sinuses will result. When the opening is small, pus has accumulated, and the swelling above extensive, it is better to enlarge the wound with a scalpel or lance, and inject it with warm carbolized water.

Contused wounds are best treated by poulticing and fomentation. If only slight, Nature herself will effect a cure. Sloughing, more or less, may be expected if the wound is more than superficial. When the injury extends to the deeper-seated structures, and there is much extravasation of blood, scarifying and repeated fomentations are indicated. When the crushing has been so great that the textures underneath the muscles and bloodvessels are ruptured, extensive sloughing is sure to follow. Healing in such a case takes place by granulation, and the reparation needed being generally considerable, caustic applications are more frequently required, with daily cleansing, and the injection from time to time of the stimulating liniment.

In all classes of wounds a certain amount of inflammatory fever is produced. This is best counteracted by light aperient medicine, plain, unstimulating diet, and quietude.

SPRAINS.

Sprains, or undue strain of the muscular or ligamentous portion of the limbs, is not an unfrequent accident in cattle, especially in those pastured on rough and hilly ground, and in working oxen. The two forms most commonly met with are sprain of the fetlock-joint and the round ligament (*ligamentum teres*) of the hip. The pain attendant upon such injuries is exceedingly acute, and accompanied with swelling, and often considerable febrile disturbance.

Treatment.—This should consist, until the inflammatory symptoms have subsided, in continued warm fomentations to the injured part, aperient medicine, and rest. Afterwards it may be necessary, in the case of the injury occurring to the fetlock-joint, to support the part with a splint or starch bandage. When thickening, with

chronic inflammation, remains, cold water and the following lotion will be useful :

Acetic Acid.....	1 ounce.
Arnica Tinct.	1 ounce.
Spt. Vini et Camph.	2 ounces.
Aqua	8 ounces.

To be used after the cold water.

This failing, iodine ointment, stimulating embrocation, a blister, or the actual cautery may be advisable.

Sprain of the round ligament of the hip-joint may be caused by kicks from horses, blows, falls, or "mounting" upon one another, etc.

Symptoms.—A beast so injured is unable to advance the leg except under extreme circumstances ; the quarter is lower than the opposite one, and the limb continually flexed. Pain is present throughout, but progression or movement of any description considerably augments it. Usually such cases are protracted under the best of treatment, and more or less wasting of the muscles invariably ensues.

Treatment.—This consists, as in the previous form, in maintaining perfect quietude, and the application of those chemical agents already prescribed. A laxative diet should be allowed, and a mild aperient from time to time is advisable. In chronic cases setons are most advantageous.

INJURY TO THE STIFLE-JOINT.

This is a very frequent accident in cattle, a case of which at the present time, of a severe nature, I have under treatment. It usually occurs from rushing through doorways, and also arises from kicks, blows, and bruises.

Symptoms.—A large, fluctuating swelling on the inner, outer, or both sides of the stifle, and very often simulating, for which it has been mistaken, dislocation of the patella. In severe cases, where the concussion has been directly on the face of the stifle-joint, the swelling appears in front. The animal is reluctant to place any weight on the limb, and will not lie down if possible.

Considerable pain, attended with febrile disturbance and loss of appetite, is present.



Fig. 141.—Stifle Joint after Severe Injury.

Fig. 142.—Ox with Injured Stifle Joint.

a, swelling above and on the side of the patella, or knee-cap ; *b*, *b*, swelling denoting injury of the femoro-tibial articulation, or true stifle joint ; *c*, front of the joint.—*Armatage*.

Treatment.—In the first instance continual hot fomentations, laxative medicine, and quietude. Subsequently the following lotion may be applied twice or thrice daily :

Arnica Tinct.	2 ounces.
Acetic Acid	1 ounce.
Ammonia Fort	$\frac{1}{2}$ ounce.
Soap Liniment	10 ounces.

In chronic cases the measures set forth for sprain of the round ligament of the hip (excepting the seton), are indicated.

TRACHEOTOMY.

In cases of threatened suffocation from obstruction in the upper portion of the breathing apparatus, as in laryngitis, it frequently becomes imperative to perform tracheotomy. This is effected as follows :

The animal's head being extended so as to stretch out the neck, the most superficial part of the trachea is ascertained, being about the centre. A longitudinal incision from two to three inches is then made through the skin and muscles, and the edges held apart

to expose the trachea. A tenaculum or curved needle is then passed through a portion of two of the tracheal rings, and a circular portion large enough to admit the tracheotomy tube is cut:



Fig. 143.—Tracheotomy: *a*, *b*, the tube; *c*, tracheotomy tube applied—*Armatage*.

out with a scalpel. After which the tube is inserted and maintained in position by tapes or straps round the neck (Fig. 143). It should be removed daily and cleansed with carbolized water and warmed before re-insertion.

ESOPHAGOTOMY.

In the *Veterinarian*, 1840-48 and '69, this operation is recorded. Its employment is usually the result of an impaction of a portion of root immovable by other means. Professor Simonds thus describes its performance.

"The animal's right side should be pressed against the wall with the head elevated so as to stretch the skin, or else a man should stand in the hollow of the neck as in the act of drenching. The incision should be made through the skin immediately over the central portion of the obstruction in a line with the œsophagus and extending above and below the obstruction. We can scarcely cut down on the œsophagus without incising the sterno-maxillaris muscle, which does very little harm. Not only is this tube free to move, but it is composed of two layers of fibre, lined with a membrane of a peculiar nature, being highly elastic, composed almost entirely of yellow elastic tissue; and in operating we must guard especially against the recedure of this membrane, therefore

a curved needle should be passed through the wall of the œsophagus, embracing this lining membrane and a portion of the root, taking care when making the incision not to cut the stitch. This being accomplished, the ligature may be drawn tight, and thus secure the lining membrane with the wall of the œsophagus. Having extracted the obstruction, the œsophagus is closed with sutures (carbolyzed catgut—*J.W.H.*), and the external wound also closed.

"As the result of this operation we have to guard against 'stricture;' next day there will be considerable tumefaction; bandages should be used with cold or warm water. In some instances warm will prove most beneficial, on account of facilitating suppurative action. As soon as we find an accumulation of pus, it should be at once liberated, or burrowing and sinus will result. In the latter event the best measure is to pass a curved needle down with tape attached and make an external opening. Regarding stricture, much will depend upon keeping the lining œsophageal membrane in a proper position and preventing any untoward result. Quietude should be observed from forty-six to forty-eight hours after the operation, and then nutritious diet of a fluid nature should be allowed in small quantities, as well as boiled gruel of either linseed or oil-cake. Then, if the patient progresses favourably, begin with aleppy mashes and continue such food for some time to prevent rumination, and return gradually to the usual regime when the healing is complete."

French authorities have recommended the insertion of a fine probe-pointed bistoury into the œsophagus, and cutting the obstruction into numerous pieces, and then separating them by external manipulation. The operation is feasible, less formidable than œsophagotomy proper, and deserving of trial in this country.

LITHOTOMY.

Lithotomy—"cutting for stone"—is an operation seldom performed on the ox. It consists in incising the urethra to a sufficient extent to allow an extraction of the stone, which, as Professor Williams observes, is "most commonly found in the urethra in these animals, and by following its course externally it will be found distended and fluctuating until the obstruction is reached." Tapping the bladder through the rectum has been recommended, but has found few supporters.

LITHOTRITY.

This consists in crushing the stone so that it may be expelled through the urethra. A perineal incision in the male is necessitated, as in lithotomy.

HERNIA.

Hernia signifies the protrusion of any organ from its natural cavity, whether through a natural or accidental opening. Abdominal hernia is the most frequent form met with in the ox, and the several kinds which exist are thus named according to their situation: *Inguinal hernia*, *Femoral hernia*, *Ventral hernia*, *Diaphragmatic hernia*, *Umbilical hernia*, *Meenteric hernia*, *Vaginal hernia*, *Uterine hernia*, *Pelvic hernia*.

Hernia may be *congenital*, *acquired* at birth, immediately after, or later in life.

Complete or *incomplete* hernia are terms used according to the amount of protruded viscus. *Reducible*, or *irreducible*, in proportion to the ability to return the organ; *strangulated*, when the protruded viscus is constricted; *incarcerated*, when the contents of the hernia cause obstruction to the fecal passage through that portion of intestine, but in which there is neither strangulation nor impeded circulation.

Gastrocele, *enterocele*, *epiplocele*, *cystocele*, are names suggested by the particular viscus protruded, viz., the stomach, intestines, omentum, and bladder.

"*Causes*.—The formation of hernia depends upon a weakness of some point of the abdominal or pelvic wall, and thus an insufficient resistance to the protruding pressure of the viscera, as subject to the compressing action of the abdominal muscles and diaphragm. The causes of hernia are, therefore, of two kinds—*predisposing*, and *exciting*.

"*Predisposing Causes*.—*Structural* predisposition consists in the natural existence of the various anatomical apertures in the abdominal and pelvic wall, corresponding to the normal situations of hernia; and congenital malformation is predisposing, chiefly as connected with congenital and infantile and inguinal hernia; or the predisposition may arise quite accidentally, from injury, by

contusion, or by distension of the abdomen during pregnancy or dropsy, or as the result of disease, by abscess or other weakening disorganization of some parts of the abdominal wall. *Laxity* of



Fig. 144.—Inguinal Hernia (*Equine*) : *a, a*, portion of the colon continuous with *b, b*, which is fixed in the inguinal canal ; *c, c*, is the neck of the peritoneal sheath, which is enlarged from the passage into it of the intestine ; *d, d*, tumefied portion of the spermatic cord.—*Girard*.

some of the abdominal *viscera* might be reckoned among structurally predisposing conditions."—*Gant*.

Exciting Causes.—Sudden and powerful muscular exertions, especially in strained postures of the body, violent falls, crushes, straining in urination, defecation, and parturition.

Inguinal Hernia.—This condition occurs when the bowel passes through the internal abdominal ring into the inguinal canal, or if it passes on through the external ring, it becomes a *complete* or *scrotal* hernia. Very frequently the latter is only discovered when castration has to be performed, and then the covered operation must be adopted.

When this form of hernia is congenital, it often disappears with age, and the abdominal rings contracting, and the spermatic cord enlarging, a secondary descent is prevented.

Treatment.—The animal (previously fasted) being cast and placed on his back, the operator should pass his hand into the rectum to the internal inguinal ring, and having discovered the imprisoned bowel, he may endeavour by manipulation and traction to withdraw it into the abdominal cavity. Should this measure fail, and the animal is entire, the covered operation of castration is advisable. "The skin and dartos muscle are to be carefully separated from the tunica reflexa until the hernial sac is fully exposed to view; an incision, sufficiently large to introduce the finger, is then to be carefully made into it. When this is done, the operator is to pass his finger into the opening, and discover the stricture; then he is to introduce a strong '*bistouri caché*' along his finger into the stricture, and divide it, taking care to keep the back of the bistoury towards the imprisoned bowel. In many cases when the canal is thus dilated the bowel will slip into the abdominal cavity with very little trouble; but should a large quantity of intestine be imprisoned, it will be necessary to enlarge the opening in the tunica reflexa to an extent sufficient to allow the bowel to be pulled out and gently unravelled before it can be returned.

"The return being effected, the scrotum, including the skin, cord, and its tunics, are to be enclosed in a plain clam, which is to be left on until it sloughs off. Without this precaution the operation is unsafe; for the inguinal canal, which has by the operation been made sufficiently large for the incarcerated intestine to return to its proper position, is by the same operation so dilated as to present no impediment to a recurrence of the protrusion."—*Williams.*

It is imperative that quietude should be observed after the operation. Opium may be given to allay pain and also for the

purpose of temporarily suspending the action of the bowels pending their restoration to a healthy condition.

Femoral Hernia.—Femoral or crural hernia is seldom met with in bovine practice. The protrusion takes place through the crural ring and canal, and takes up its position in the sheath of the femoral vessels beneath the femoral vein. The appearance presented in femoral hernia is that of a soft swelling in the groin and perhaps extending on to the thigh. Surgical treatment as adopted on the human subject might be attempted, but the results would be very doubtful, and where strangulation exists, immediate slaughter is advisable.

Ventral Hernia.—This consists in protrusion of the abdominal viscera through any portion of the muscular abdominal walls. It is frequently met with in cattle at pasture, and usually arises from external violence, either from the "butting" of another animal or "staking." The protrusion appears suddenly, as a broad irregular flat swelling somewhat similar to umbilical hernia, but more reducible and seldom accompanied by strangulation.

Treatment.—Unless the rupture and protrusion is very small, an operation for radical cure should be performed, and particularly is this essential in breeding-cows, as during pregnancy the rupture is liable to become considerably enlarged. The animal, being previously fasted, should be cast and placed in a position favourable to the return of the protruded viscera. The latter being accomplished, an incision is made through the skin sufficient to permit an examination with the finger as to the extent of the opening through the abdominal walls. This being ascertained, the skin wound may be enlarged according as may be necessary for the surgical treatment of the rupture. The lips of the inner wound should be brought together and retained by continuous carbolized catgut sutures, taking care to embrace both muscle and peritoneum; if only the former is operated upon, the sutures are apt to give way before adhesive inflammation and lymph deposit have effectually done their work. Again, the ox is less liable to peritoneal inflammation than any other animal, so that no fears need be entertained of peritonitis by the insertion of the needle into the latter structure. The external wound may be closed with metallic sutures. After the operation the animal must be kept quiet, and fed on soft and easily digestible food until recovery is complete.

Youatt observes, "If the horn should have broken the skin, as well as lacerated the muscular part beneath and the intestine protrudes, it must be cleared from any dirt or extraneous matter about it, then carefully returned, and the wound closed and the bandage applied as already directed.

"I have not only," he further remarks, "seen a considerable portion of bowel protruding, but the bowel itself torn. Even then I have not despaired, for the healing power in these animals is such as the human surgeon would scarcely deem possible. The rent of the intestine may be closed by a stitch or two, with well-founded hope of the edges uniting and the intestinal canal becoming perfect and whole."*

Diaphragmatic or Phrenic Hernia.—This is where one or more of the abdominal viscera, usually gastric, protrude through the diaphragm into the chest. Such a condition gives rise to extreme pain, difficult respiration, and cough. Youatt says: "In distension of the rumen there is always great pressure against the midriff. This is increased when severe colicky pains come on, and especially when improper means have been resorted to, such as strong stimulating drinks or rude exercise, or when the animal, in a state of half-unconsciousness, has violently beaten himself about. The midriff (diaphragm) has then given way, and a portion of the intestine, or of one of the stomachs, or of the omentum or caul, or of the liver, has been forced into the cavity of the chest. This may be suspected when, after the usual symptoms of hoove or colic, great difficulty of breathing suddenly comes on, and is evidently

* "Dr. Cheselden relates a very extraordinary case of this healing power, and does not forbid hope, although the intestines may have been injured to a very great extent. "An ox," he says, "was suffering under constipation of the bowels. Thomas Brayer, a doctor for cattle, opened the ox in the flank, and took out great part of his bowels, upon searching which he found there was a perfect stoppage in the guts, and the gut was, about the stoppage, putrefied for three-quarters of a yard; whereupon he cut off so much of the gut as was putrefied, and took it quite away, and then drew the ends of the guts which remained sound, after what was cut off, together upon a hollow keek, which was about three or four inches long, and sewed the said ends of the guts together upon the said keek, leaving the keek within the guts, and then sewed up the whole cut in the hide upon the flank of the said ox. Within the space of one hour after this operation was performed, the ox dunged, and the piece of the keek, which the said ends of the gut were sewn upon, came away from the ox with the dung, whereupon the ox recovered, and lived to do the owner service several years." The author, to use a legal phrase, reserves his opinion touching the above record.

attended by excessive pain; when the animal is every moment looking at her side, and especially at the left side; when she shrinks and bows herself up, as if the muscles of the belly were violently cramped; and when she stiffens all over, and then suddenly falls and dies in convulsions.

"Examination after death has sometimes displayed chronic rupture of this kind. The attack has been as sudden, but the colicky pains have not been so violent—they have intermitted, disappeared; but an habitual difficulty of breathing has been left behind; disinclination to rapid motion; fright when suddenly moved; anxiety of countenance; perhaps impairment of condition; and certainly impossibility of acquiring any considerable degree of condition. This has continued during several months, until the animal has been destroyed, or has died from some cause unconnected with these symptoms; and then an old rupture of the diaphragm has been discovered, the edges of which had been completely healed, and the second stomach or the liver had been firmly placed against the opening and had occupied it, and in a slight degree projected into the thorax. No medical treatment or operation could be of the slightest service in this case."

Umbilical Hernia.—This is chiefly found in young animals, and is frequently congenital. (See chapter on "Diseases and Abnormalities of the Young Animal.") In older beasts I have always operated successfully with the wooden clams, as elsewhere described.

Mesenteric Hernia.—When a portion of intestine passes through a rupture in the mesentery. *Diagnosis uncertain.*

Vaginal Hernia.—Occasionally seen in cows which have bred a large number of calves. The protrusion occurs about midway within the vagina, being only covered by the peritoneum and vaginal wall, and in some instances by the latter alone.

Treatment.—A large pessary might possibly be used with advantage. Surgical operation impossible.

Uterine Hernia.—Commonly known as "rupture of the rim of the cow's belly," is a species of hernia not unfrequently met with. Empirics take credit to themselves for the cure of many cases of this description, and also for their powers of diagnosis; but it is their erring in the latter that has endowed them with wrongly ascribed success in the former.

Cows frequently receive abdominal injuries in the region of the mammary gland, and in that organ itself, which cause intense pain and swelling, and deformity often approaching a limited form of uterine hernia. Very recently the author was called to a case of this description on the Chyknell estate. The animal, which was a milch-cow, was discovered a few days previously, on bringing her up from pasture, to be sore and swollen on the milking side; but no particular notice had been apparently taken of the fact until more aggravated symptoms developed, when professional advice was sought. On my arrival, I was immediately informed by a somewhat garrulous and self-opinionated cowman that he "know'd what was the matter with her—her'd broken the rim of her belly: he'd seen scores o' cases." An examination, however, proved that *some one* knew a great deal about the case, for the poor beast had evidently received a heavy kick immediately above the mammary gland. Enormous effusion and extravasation of blood had taken place under the skin and between the abdomen and udder, giving the latter a displaced appearance, which in fact was really the case. The opposite side was normal, and therefore one point in favour of there being no rupture was obtained. An extremely rapid, small pulse, hurried breathing, injected mucous membranes, diarrhoea, claret-coloured urine, sanguineous milk on the injured side, and cold extremities, betokened an unfavourable termination. But no; the cowman wouldn't believe it, asserted his positive opinion that the rim of the belly was broken and nothing else. Diffusible stimulants were administered, and continuous hot fomentations ordered, with suspension of the udder. The following morning the animal died. Owing to the suspicious circumstances attending the case, and to prove beyond doubt its nature, a post-mortem examination was made. On removal of the skin, putrid coagula of blood and serum existed extensively, and the mark of a blow was plainly present immediately above the udder, such as would be produced by the toe of a heavy boot, or horse's shoe. At this place and some distance around it, the peritoneum was intensely inflamed. The two quarters of the udder on that side were perfectly gangrenous. On removing the whole of the gland, the abdominal walls were found to be intact—no sign whatever of rupture. Yet I was questioned previous to my post-mortem examination as to the probability of a cure, assuming it was a case of uterine hernia :

the cowman having informed his master that he knew of a man who could have cured her; the said individual's treatment being to place the animal on its back, put the womb back, and make a truss of the udder. Wondrous individuals truly exist, and the mind of the untutored cowherd is strangely susceptible to receive gammon as fact.

For further remarks on uterine hernia, and illustration, see chapter on the "Diseases of the Generative Organs."

Pelvic Hernia ("Gut-tie").—See "Diseases of the Bowels."

RUMENOTOMY.

This operation is indicated in those cases of *plenalvia* or over-distension where the urgency of the symptoms is extreme, as in congestion of the brain, threatened asphyxia, and exhaustion. Fig. 145 shows the position of the rumen. Rumenotomy consists

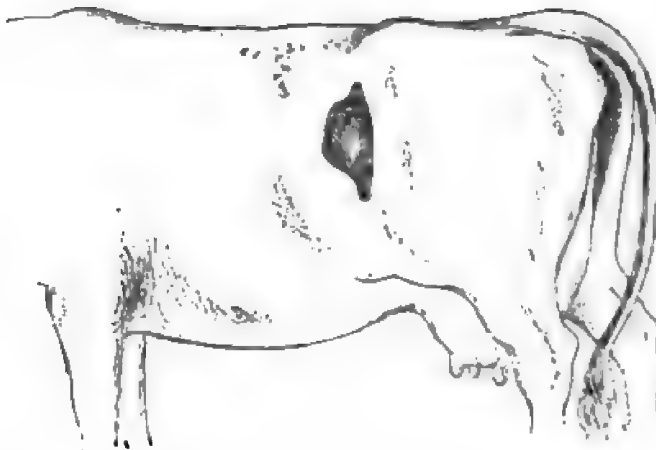


Fig. 145.—Rumen exposed for Mechanical Removal of its Contents.—*Armatage.*

in removing the contents of the viscus through an artificial opening. The operation is performed as follows:

The animal being conveniently and firmly placed with its right side against a wall, and the nose securely held, an incision is made at

the point where the rumen is punctured for hoven ; it should be then carried obliquely downwards and a little forward, until sufficiently long to easily admit the hand ; having exposed the rumen, a similar cut is to be made in the rumen. (Professor Simonds advises the immediate puncture with a trochar to liberate the gaseous matter before proceeding to incise it, and then to dilate the puncture enough to put a stick on each side of the abdominal muscles afterwards increasing the incision sufficiently to correspond with the external wound.) To prevent the ingesta falling into the abdominal cavity, it is advisable to place a napkin from the outer wound into the rumen and pass the contents over it. Authorities differ as to the evacuation. I agree with Professor Simonds that it is not wise to completely empty the rumen, especially after prolonged distension and when the muscular tonicity of the coats of the rumen has been lost, otherwise there is danger of fatal collapse. Hard pieces should always be removed or broken down.

This part of the operation being finished and the edges of the wound cleaned and inverted, the incision in the rumen should be closed with uninterrupted carbolized catgut suture. The external wound, embracing the integument, muscle, and peritoneum, is best closed with interrupted stout metallic sutures, and some authorities recommend a pitch-plaster to be applied over it ; others a cold wet compress. I prefer no covering and the occasional bathing with warm carbolized water. For the first few hours after the operation the animal should not be allowed to swallow anything, and then only fluids, as tepid gruel and an oleaginous draught. The immediate administration of cathartics, or, still worse, the injection of them into the organ, is deserving of strong condemnation. To restore tone to the organ, aromatic stimulants and vegetable bitters mingled with mucilaginous fluids are the agents most beneficial.

GASTRO-HYSTEROTOMY.

Gastro-hysterotomy, or the Cæsarean section, is an operation for the removal of the foetus from the uterus when its birth is unable to be accomplished by the natural way. The measure, which is a very formidable one, consists in making an opening through the abdominal walls, thence into the uterus, and extracting the foetus and its membranes. The operation is very frequently successful

as regards the offspring, but the contrary as regards the parent. Death of the latter may result from shock to the system and exhaustion, septic infection, peritonitis, or metro-peritonitis. Anti-septic precautions are especially indicated, and the operation should always if possible be performed early, as the chances of double success, *i.e.*, to mother and offspring, are more likely to follow than when there is great prostration and debility. I extract the method of procedure from Fleming's "Veterinary Obstetrics:"

"The incision is made in the right flank, rather below, and in front of the anterior spinous process of the ilium, so as to avoid wounding the circumflex artery—an accident which might embarrass the operator; if this or any other artery is wounded, it must be tied immediately. If there is no great hurry, and the hair is long, this had better be clipped off. The incision should pass downwards and forwards, in the direction of the fibres of the small oblique muscle of the abdomen (no muscle should be cut across); it should extend through the skin to the muscles; and even if it passes into these, there is no danger to be apprehended.

"The length of the wound will, of course, depend upon the size of the animal: for the mare or cow, it may be from twelve to fourteen inches. The layers of muscles are to be gently cut through until the peritoneum is reached, and into it but a small opening is to be made, but in doing this the greatest care is to be exercised, so as not to wound the viscera. The two first fingers of the left hand are passed through this opening, the back of the hand downwards; the blade of the probe-pointed bistoury is placed between these fingers, and carried along, cutting through the peritoneum and muscles until the opening is of the same length as that in the skin. An intelligent assistant should be at hand to prevent the escape of the intestines through this large aperture.

"The arm of the operator is now pushed into the abdominal cavity in search of the uterus, which, when found, is brought opposite the incision, should it not be there at first. Two assistants compress the sides of the wound, so as to maintain them closely against the uterus; this the operator cuts through slowly, layer after layer, using all diligence so as to escape wounding the foetal membranes.

"Two fingers are insinuated between the walls of the organ and these membranes, and the bistoury is again employed to dilate the

opening, as in the peritoneal incision, so as to give it nearly the same direction and extent of that in the abdominal wall. Should the membranes be still intact, they are to be torn, and the 'water' allowed to flow—but only outside the abdomen, if possible. The operator now, plunging his arm at once into the cavity of the uterus, seizes the first parts of the foetus that come to hand—(feet, legs, head, or hind-quarters, if possible—and removes it quickly; the umbilical cord is torn or tied, and the young creature given to those who will dry and rub it, wrap it in a warm blanket, and otherwise attend to it.

"The obstetrice immediately, if the parent is to be preserved, removes the foetal membranes—an easy task comparatively in the mare, much more tedious and difficult in the cow, as all the adhering cotyledons must be separated one by one. Then, by means of a sponge, all the fluid remaining in the organ is to be cleared out, as well as any that may have escaped into the abdomen. It might be well to damp the interior of the uterus with a very weak solution of carbolic acid. This accomplished, the great wound is to be closed.

"Nothing is done to the uterus as a rule; the organ soon diminishes very considerably in volume, and it would appear that the wound in it is not long in cicatrizing. The borders of the wound in the abdomen, however, must be speedily and solidly united. The best means of union is undoubtedly the quilled suture, which is to be applied according to the ordinary rules of surgery;* care must be taken to make the sutures enter at a good distance from the border of the wound, and to include the muscles as well as the skin. If the cord fixing the outstretched hind-limb is slackened a little, it will facilitate closing the wound. A small corner should be left open at the lower end of the wound, to allow the products of inflammation and suppuration to escape. External to the wound, either a layer of fine tow or lint, slightly carbolicized, or oakum, may be placed. Over this, long narrow strips of canvas

* "The 'quilled' suture consists of a number of interrupted sutures secured, not across the lips of the wound, but on either side, to a quill, piece of bougie, or other small cylinder, placed parallel about half an inch from the margins of the wound. Textures below the surface are thus approximated and steadily held together; an advantage in respect to a deep wound, as well as in any movable part. Ruptured perineum is thus secured."—*Gant*.

covered with melted glue may be fixed, to support the sutures and retain the dressing; then on these another thin layer of carbolized tow or oakum; and lastly, the wide body-bandage around the abdomen and loins of the creature. Though it is somewhat difficult to apply, yet it is essential that this bandage or compress be put on before the animal is allowed to rise. Afterwards the bandage may be adjusted and tightened if necessary.

"When the incision is made at the *linea alba* the procedure is somewhat similar; but, as we do not recommend it for the reasons above stated, we need not allude to it further.

"The after-treatment of the wound is that followed for all such serious traumatismas. Cold water, or ice, or very dilute carbolic acid, may be applied to the wound, if necessary; but very often this requires only ordinary surgical management. *The patient must not be allowed to lie down until the wound is united.*

"The diet should be light and sloppy for a short time, unless the animal is very feeble, when nourishing food must be given.

"The bad results to be apprehended from the operation are septic metritis, or peritonitis, or both; abscess at the seat of incision, or adhesion of the abdominal organs to this part."

EMBRYOTOMY.

Embryotomy, or *embryuleia*, consists in the removal of the fœtus by dissection, specially contrived instruments being employed for the operation. The various measures adopted in embryotomy are: *Cephalotomy*; *craniotomy*; *decapitation*; *amputation of the limbs*; *detruncation*, or *division of the fœtus*; *evisceration*.

Cephalotomy is an operation for producing diminution in the size of the head, either by *puncture* (see "*Hydrocephalus*"), *incision*, or *crushing the cranial bones*.

Craniotomy, incision of the cranium, is executed with a straight or curved bistoury, embryotomy scalpel, bone-chisel or saw.

Crushing can sometimes be accomplished with the hand, otherwise the cranial bones may be cut through.

Decapitation, separation of the head from the body, is effected by securing the head, drawing it as near to the vulva as possible, and then by means of the curved finger-scalpel incising the skin around

the neck and disarticulating the vertebrae—assistants simultaneously pulling the head to facilitate separation.

Amputation of the Limbs.—In removing a fore-limb it is necessary to bring it well forward (if contraction exists the tendon should first be divided); the skin is then to be incised completely round the limb, as high up as possible, and an incision carried longitudinally on the outer side of the limb up to the shoulder, the skin being separated from the structures underneath. This detachment being accomplished, pressure against the sternum of the foetus is to be employed simultaneously with powerful traction on the skinned limb, which operations will speedily effect its removal.

The hind-limbs are removed with greater difficulty. The incision and separation of skin must be adopted as in the case of a fore-limb, followed by division of the gluteal and other muscles of attachment. Pressure and traction are subsequently necessary for removal.

Detruncation.—The presented portion of the foetus should be exposed as far as possible, and the body detruncated close to the vulva. Disarticulation of one or both of the limbs of the portion retained may be necessary to accomplish complete delivery.

Evisceration, removal of the thoracic or abdominal viscera. In operating for the former, the head and limbs being secured, the hand carrying an embryotomy knife is introduced into the vagina and passed to the chest of the foetus, which is then to be divided from above downwards between the two first ribs. This incision being well effected, the hand is re-introduced, the two first ribs removed, and the thoracic organs torn from their attachments and brought away. By tearing away the diaphragm, the abdominal viscera may also be removed through the chest—excepting in posterior presentations, when an incision through the abdominal parietes will be necessary.

These operations, with illustrations of the instruments used, are given in detail in Mr. Fleming's "Veterinary Obstetrics."

CASTRATION.

This operation is performed in various ways. In India "mulling" is usually practised (*orchithlasis*). This consists in breaking down

the structures of the spermatic cord. The animal being cast, properly tied, and placed on his back, "a slip-noose is passed over the scrotum and its contents, and run tightly up to embrace the spermatic cord and tegumentary covering. An assistant draws on this ligature until the strangulated organs rest firmly on the left thigh, so that the right testicle presents a bold face to the operator, who stands opposite his assistant, armed with a slightly curved staff of heavy wood, about two feet long, and having a diameter of an inch and a half. Its convex face is the contusing one. The testicle, being held in a favourable position, is dealt a smart blow, and its integrity is in most cases destroyed without a second application. The right testicle is similarly treated on the left thigh.

"Total demolition of the scrotal contents is ensured by their being rapped with the staff from side to side. The spermatic cord above the ligature is then well beaten as it lies on the flat of the animal's leg, and a little grease having been applied to the scrotum the operation is complete—nothing but a soft, fluctuating, jellied mass remaining."—*Poysor*.

It is scarcely necessary to remark that all veterinarians would condemn such a needless and barbarous operation. Indeed, as Mr. Poysor observes, "We are acquainted with no operation, human or veterinary, so calculated to impress us with the idea of pain and suffering of the most sickening nature as orchithlasia; and therefore hesitate not to state that, on the score of humanity, the practice should be discontinued." A blow on the human testicle will give some idea of the excruciating pain of "mulling," and we shall have no difficulty in realizing the frantic infurcation exhibited by the victim when released from the hands of his tormentors.

In England, the operation is performed in various ways—those which find most favour are by the actual cautery, the ligature, and torsion. Castration by cautery is accomplished as follows: The animal being cast, placed in a favourable position and properly secured, the scrotum is grasped behind the testicle in such a manner as to render the skin tense over the organ; a bold incision is then made with the red-hot iron through the coats of the scrotum and the external covering of the testicle, which immediately escapes from its position. The cord is then imprisoned in a pair

of steel clams, divided with the hot iron, and the extremity afterwards seared to prevent hæmorrhage. The opposite testicle is then operated on in like manner.

When the ligature is adopted, an incision is made through the scrotum with a knife, and a piece of twine is tied firmly round the cord and spermatic artery, after which it is divided about half an inch below the ligature, and the testicle removed. As suffering is aggravated by including the cord within the ligature, it is advisable to only tie the bloodvessels, and divide the cords separately.

Torsion is a very effectual method of castration, and is now very generally practised. The testicle being exposed and the cord and vessels embraced in the steel clams, the latter are grasped in the torsion forceps and maintained with a screw. The operator then continues to turn the instrument slowly round with the right hand until the tissues have given way and the spermatic artery is drawn out or curled up into a spiral thread. The clam is then slowly removed, and the cord allowed to escape into the scrotum.

A variety of opinion exists as to when castration should be performed in the bovine species; between the second and third month is the most favourable time, both as to its surgical results and its influence on the flesh as meat. In older animals subsequent precautions are very necessary. The incisions must not be allowed to heal too quickly, or pus will be confined and give rise to serious results. Any adhesions between the spermatic cord and the external wound must be broken down. Fomentations with carbolized warm water are very useful; indeed, the operator should always immerse his instruments (excepting the hot iron) in a weak solution of carbolic acid before using them, especially the ligature.

SPAYING.

The operation of spaying (ovariotomy) is one happily becoming a past measure. The arguments used in favour of castrating female animals have never met with general support, and the present state of scientific knowledge absolutely opposes it—except as a curative agent.

The removal of the ovaries is accomplished by an external flank incision, through which both the right and left ovary are drawn

and removed by excision and ligature, torsion, or *écraseur*. The wound is then closed by suture, and the animal kept quiet, a saline aperient being given, and sloppy food allowed until no danger of untoward results is apprehended.

SORE FEET.

These are frequently the result of constant and long journeys by road. Youatt remarks: "There is not a farmer that has not had cows in his dairy that have lost for a time full half of their milk on account of the pain which tender and diseased feet have occasioned; the grazier sometimes loses the advantage of three or four months' feeding from the same cause, and in London dairies tender feet are often a most serious ailment, and compel the milkman to part with some of his best cows, and that in a very indifferent condition."

Treatment.—This consists in poulticing and rest. In working-oxen an iron plate is nailed to the hoofs as a protection against the wear and a preventive of sore feet.

OVER-GROWTH OF CLAYS.

The hoofs of animals having little exercise, especially town dairy-cattle, become considerably elongated and deformed, sometimes curving outwards, at others upwards and backwards.

Treatment.—The feet are to be reduced to their normal size and shape by removal of the superfluous growth. This is usually effected with a saw, and the foot afterward rasped and pared as may be deemed necessary.

FOUL.

This term implies an inflamed condition, usually attended with suppuration of the interdigital substance, i.e., the part between the hoofs. The hind-feet are most susceptible to foul; occasionally it has been observed in the fore-feet.

Causes.—Probably the most frequent cause of foul is the irrita-

tion produced by the presence of foreign bodies between the clays. Certain constitutional conditions, however, also favour its development; thus we find it an accompaniment of rheumatism and scrofula.

Professor Williams in his "Principles and Practice of Veterinary Surgery," when speaking of "chronic scrofulous synovitis," says: "This affection is, within my experience, confined to horned cattle, where the process of 'in-and-in' breeding has been carried out to too great an extent. The joints most usually affected are the elbow and stifle, and the foot-joints in the disease called '*foul-in-the-foot*.'"

Foul is also frequent in cattle kept on low, marshy pastures, and



Fig. 146.—Foot affected with Foul bandaged.—*Original.*

has likewise been observed to follow injuries to the pedal joints, sprains of the pastern, and filth.

Symptoms.—Lameness, fever, and loss of condition are invariable accompaniments of foul. The interdigital space is unusually wide. Manipulation between the digits or in front of the coronet causes acute pain, and abnormal heat will be detected, with often swelling of the pastern. If the case is neglected deeper structures become involved, and the disease may extend to the inter-phalangeal articulations, resulting in caries, synovial discharge, and

necrosis. The patient persistently lies, refuses food, and rapidly loses flesh, and eventually succumbs to pain.

Treatment.—In simple cases of "foul" due to the presence of an irritant, the treatment is not difficult. The foot should be carefully washed in warm water, and any foreign matter, ragged or undermined horn removed; the latter is especially necessary for the evacuation of pus. A hot bran and linseed poultice mingled with charcoal will soothe the pain, allay the inflammatory action, and materially assist recovery of the foot to its normal state; each time the poultice is removed the diseased part should be immersed in warm water and cleansed. After two or three days' poulticing the part may be dressed with antiseptics, weak caustics and astringents applied on a pledget of tow, and fixed with a bandage (See Fig. 146.)

For ordinary cases I recommend as a dressing for foul the following:

Carbolic Acid, Crude.....	1 part
Tinct. Myrrh Co.	2 parts
Tinct. Arnica	2 parts
Glycerine	4 parts

To be applied daily with bandage and tow as already described. Interdigital friction, produced by drawing backwards and forwards over the sensitive surface a piece of tarred rope, has been justly condemned; not only does such an operation "inflict sad and unnecessary torture on the animal," but it exposes the ignorance and brutality of the operator, and adds one more link to the chain of empirical absurdities.

To allay febrile disturbance a saline aperient may be given, and the drinking-water nitrated. The patient should also be kept quiet. The fact of a recumbent position affording it ease indicates the advisability of not putting unnecessary weight upon an inflamed and acutely sensitive structure. In cases of severe pain and depression diffusible stimulants and opiates are required.

Professor Williams observes: "In the majority of cases, if not caused by tubercular inflammation, the disease, if attended to in time, is not difficult to manage; the treatment being the careful removal of all loose horn under which pus is seen to burrow, mild

astringents, poultices, and a purgative. In the more severe cases, where the interdigital substance undergoes sloughing, the process must be assisted by warm poultices and fomentations. Afterwards the wound must be treated with astringents, great cleanliness, and protected by nice pledgets of tow steeped in a weak solution of carbolic acid, kept in their position by carefully-adjusted bandages. There are other cases where the phalangeal bones are involved as high as the fetlock, with hard swelling of all the tissues, separation of the digits by enlargement of the interdigital substance, dislocation of the interphalangeal articulations, caries of the articular extremities of the bones, synovial discharge, necrosis of the canons, great suffering, and lameness. Cattle, when so sorely troubled, will lie down, groan with pain, and refuse to feed, the flesh quickly wasting; great sores appear upon various parts of the body on which they lie; and many will give up the battle altogether, and die right away, as if their hearts were broken. Now, in such cases, whether the cause be tubercular deposition or not, the only method of cure is by amputation or disarticulation. I have performed these operations with the greatest success, and I am thus in a position to suggest the best method.

"If the disease has not yet extended above the metacarpophalangeal articulation, the foot and pastern may be removed by disarticulation through the fetlock-joint; but if this joint be involved to any considerable extent, it will be necessary to amputate through the cannon-bone. The operation is as follows: Before the animal is cast, the diseased limb must be protected by a bandage, and when the animal is down, removed from the casting-rope, fastened by a cord tied around the pastern, and held in position by two assistants, a tourniquet is then to be applied above the seat of the intended section. The knife must be strong, with a narrow blade; and care is to be taken that sufficient skin be left to form a good flap, so that the exposed end of the bone, as well as the soft parts, be completely covered when the edges of the wound are brought together. When the bone has been removed, the arteries are to be carefully taken up and secured by ligatures, and the whole extremity of the limb afterwards enveloped in carbolized lint or fine tow, firmly, but not too tightly, bound with a bandage. If the discharge is not very profuse, little after-treatment is required beyond cleanliness and occasional re-adjustment of the

dressings. The animal must be well supported with nutritious food, and prepared for the butcher as quickly as possible."

AMPUTATION.

As illustrative of this operation, which is briefly described above, the following interesting case of "Amputation of the Metacarpus in a Cow," is recorded by Mr. W. E. Litt, in the *Veterinary Journal*, April, 1877: "On the 8th of August last year, I was somewhat hurriedly sent for to see a two-year-old shorthorn heifer, the property of John Evans, Esq., of Uttington, Salop. I found the animal standing in the middle of a field on three legs. A glance sufficed to show me that the off fore-leg was hopelessly fractured; and on more careful examination, I found that that part of the shaft of the metacarpal-bone which is comprised in the middle third was reduced to a mass of splinters. The owner was particularly anxious to save the animal's life, as she was one of a very choice strain of blood. As it appeared to me to be quite hopeless to think of union ever taking place, I decided to amputate. Having directed that the heifer should be taken from the open field to the farm-building, which was at no great distance, I returned home for the necessary instruments, and with as little delay as possible proceeded to operate. Having cast and secured the patient, she being placed to lie on the near side, I selected the most powerful man present (he being a brawny waggoner), and directed him to take his seat on the side, or rather on the shoulder of the heifer, with one leg on either side of hers, and firmly grasping it with both hands. I then placed a tourniquet on the limb immediately above the knee, the compress being of course placed immediately on the radial artery, the pulsation of which could be distinctly felt. The preliminaries being thus completed, I commenced my incision by passing the knife directly through the leg as close to the back of the metacarpal-bone as possible, the edge of the knife being towards me, and about an inch and a half from the head of the bone. By then cutting downwards and backwards, the knife was brought out some three inches lower down, at the back part of the leg. I then proceeded to make a similar

flap anteriorly. This was a work of greater difficulty, as there is little more than skin in front of the shin, and this had to be dissected back. However, by the exercise of a little patience I managed to make a satisfactory flap. These two being held back by an assistant, the shaft of the bone was immediately severed as high as it was possible to reach with the saw. The artery was then tied, and the two flaps brought into apposition and firmly sutured with double strong thread sutures. A large pledget of tow was then placed on the end of the stump, and secured with some seven or eight yards of roller bandage of unbleached calico. The patient was then released, and immediately jumped up. She was placed in a loose box and supplied with green food and bran mash. The bandages were left intact until the eighth day, the animal in the meantime being perfectly comfortable, and feeding the whole of the time just as though there were nothing at all the matter. As I have said, on the eighth day following the operation I removed the bandages, and was pleased to see that union had taken place in about the upper two-thirds of the wound, both on the inner and outer side. The sutures at the end of the stump had, however, broken out, and the end of the bone was exposed. From this there was some little discharge, rather fetid, but not much in quantity. A pledget of tow saturated in some mild carbolic dressing was fastened on by means of a narrow roller bandage, and changed daily for about ten days, when it was altogether discontinued.

"On the 8th of September I made an examination of the stump, and found that it was to all outward appearance completely healed over; on looking over it, however, more carefully, I saw that the circular rim of bone at the end of the shaft was not completely covered in by the granulation, although this itself had become tolerably hard and dry. I fancied, too, that the end of the bone seemed to be loose, or getting down to it. This proved to be the case, for on laying hold of it with a pair of forceps it readily came away—a ring of bone. After this the stump soon became perfect. Having succeeded beyond my expectation in disposing of the damaged limb without interfering with the patient's general health, I began to think it was time to get an artificial leg to supply the deficiency thus created, although I must say that it was perfectly marvellous how well the poor animal hopped about on the other three—lying down and getting up without the least trouble or

difficulty. Having taken the precise measurement of the stump, the knee-joint, and the arm immediately above, I applied to my saddler, who readily constructed what must be called a perfect masterpiece in the matter of artificial legs.

"I regret exceedingly that my powers as a draughtsman are so limited as to utterly preclude the possibility of my even attempting to give you a sketch of the wooden leg. Suffice it to say that it differs in no material particular from the ordinary *human* wooden leg, and is easily and securely fastened by means of a broad strap round the leg, immediately above the knee. The socket into which the stump is received is lined with soft leather and padded out with wool, and is sufficiently deep to admit also the lower part of the knee-joint, but does not in any way interfere with the flexion of the joint. The animal can walk, lie down, and get up with perfect ease, and is to all intents and purposes just as well off with the artificial leg as it was with the natural one. I see no reason why it should not become the mother of any number of calves; but whether it should prove successful for breeding purposes or not, one thing is quite clear, from its present forward condition, that it will make a very useful animal to the butcher. I should add, perhaps, that the artificial leg is not constantly worn. Experience has shown that there is no necessity for it when the animal is indoors. When she is required to go out, it is the work of a few seconds only to buckle on the leg. As the subject of amputation is one which has scarcely been considered a part of veterinary surgery, the recital of the above case will doubtless call to the recollection of many practitioners similar cases where the operation might have saved the lives of animals more or less valuable, but which were sacrificed."

DISHORNING.

This cruel operation, which still has its advocates in the sister Isle, consists in sawing off the horns close to the head, plugging the orifices with cork, tow and tar—or what is more frequent than either—dung and other filth. Not only is the pith or core of the horn an exceedingly vascular and sensitive structure, as shown by the profuse hæmorrhage and pain caused by its fracture, but the

bone of the horn itself through which the saw passes is exceedingly vascular. According to Youatt, "It is the most vascular bone in the whole frame, for it has not only to carry vessels for its own nourishment, but for that of its covering." And concerning the degree of fever estimated by the horn, he further remarks "Nowhere else can the practitioner get so near to the circulating fluid, or to so great a quantity of it." And again, "It is by reason of the extreme tenderness at the root of the horn, that some fool-hardy and brutal fellows have declared that, armed only with a stout bludgeon, they should not fear any bull, for one or two heavy blows on this part would stupefy and put to flight the most ferocious beast." Have these fiends ever had their finger-nails crushed in a doorway? if so, they will have experienced a modicum of the pain inflicted by dishorning.

A result of this iniquitous practice is suppurative inflammation at the root of the horn, often extending to the membranes of the brain and producing agonizing suffering to the poor animal. No reasonable excuse, scientific or otherwise, can be made for the performance of this operation, as no possible benefit can accrue to the animal or purchaser. As a system of fraud it has been adopted to palm off Irish cattle for polled Scots, an illustration of which recently came under my notice as inspector. In England the practice of dishorning will not be tolerated in our markets or fairs, Ireland alone holding the unenviable plume; and every right-minded veterinarian would but fulfil the sacred duty of his calling in bringing to speedy justice any individual he knew to be guilty of such an act.

VEINING.

This operation consists in exposing the vein in front of each pastern, taking it up nerve-fashion, as in neurotomy, and snipping a portion of the vessel out. The operation is adopted in young stock as a preventive measure against Quarter-evil, or Black-leg. Though the practice is still pursued in some parts of England—notably Yorkshire—it is, I am thankful to say, becoming a thing of the past. The absurdity of such an operation is obvious.

VACCINATION.

This operation has been from time to time performed on the same principles as that for small-pox. During the outbreak of Rinderpest, 1865-66, it was extensively resorted to by the medical profession, but owing to the absence of analogy between that disease and variola, the results were necessarily barren; neither has success attended it, for the same reason, when adopted in other maladies of a non-variolous nature. Animal vaccination is accomplished in a similar manner to that of human vaccination, the part selected varying.

CHAPTER XXV.

POISONS AND THEIR ANTIDOTES.

VARIOUS forms of poisoning are observed in cattle as in other creatures—and such poisons are derived from various sources, notably the vegetable and mineral ones—either of which may occur from their intentional administration, or the voluntary partaking of them. Considerable carelessness is frequently manifested in dispensing cattle medicines, as well as ignorance in farriers, a handful of this or a pinch of that being indiscriminately ordered. Accidental poisoning also often occurs from want of due precaution on the part of the dispenser, or those in charge of the animals: viz., in either not labelling the medicine or not making the directions sufficiently clear, and on the part of the latter in allowing the same to lie about and become mixed with other parcels or bottles containing dangerous compounds.

I propose in this section to divide the poisons commonly met with in bovine practice into three classes—irritants, sedatives, and narcotics. A fourth, “septic” poisoning, more properly comes under the head of “Blood Diseases,” and will be found discussed there.

Irritants include all poisons creating symptoms of irritation and inflammation. Sedatives are those which depress nerve-force without preliminary excitation. Narcotics produce stupor, delirium, spasms, paralysis, and other cerebral and cerebro-spinal affections.

The following table gives the principal agents in these three classes:

IRRITANT	Corrosive Sublimata.
	Arsenic.
	Copper.
	Iron.
	Zinc.
	Oxalic Acid.

IRRITANT (<i>continued</i>).....	{ Ammonia. Savin. Cantharides. Croton. Hellebore. Hemlock. Hemlock Dropwort. Water Hemlock.
ASTRINGENT IRRITANT.....	{ Acorns. Oak Shoots. Fern.
SEDATIVES	{ Hydrocyanic Acid. Aconite. Digitalis. Colchicum. Yew. Lead.
NARCOTICS	{ Opium. Tobacco. Hyoscyamus. Belladonna. Camphor. Laburnum. Chloroform. Strychnia.

IRRITANT POISONS.

CORROSIVE SUBLIMATE is one of the most active of irritant poisons; rapid emaciation and death has occurred in fourteen days from the administration of two drachms. Acute gastro-enteritis is usually produced by it, whilst smaller and frequent doses induce violent mercurialism. According to Gamgee, it causes an exhausting cough in ruminants.

Post-mortem Appearances.—There is more or less disorganization of the stomach and intestines. Sometimes the coats of both are entirely destroyed; in all cases there is more or less corrosion and ulceration with intense surrounding inflammation. “The

appearance of this corrosion differs according to the rapidity of the poisoning. In very rapid cases, for example in animals which have survived only twenty-five minutes, the villous coat has a dark-grey appearance, without any sign of vital reaction."—*Christison*. In more prolonged cases, where as many hours have elapsed prior to death, the corrosion is black, like the charring of "leather with a red-hot coal, and the rest of the stomach scarlet-red or deep rose-red, showing that inflammation had set in."—*Valentine*.

"The corrosion caused by mercury, if examined before the slough is thrown off, will be found to possess an important peculiarity. The disorganized tissue yields mercury by chemical analysis."—*Christison*.

The kidneys and other urinary organs are unusually vascular; the lungs spotted with effused blood; and the heart occasionally inflamed, and filled with blood, thus indicating a state of paralysis which probably depends on derangement or depression of the nervous system.—*Moiroud*.

In the human subject shrivelling of the tongue, with great enlargement of the papillæ at its root, has been observed in poisoning by corrosive sublimate.

Antidotes.—Albuminoids, as white of egg, gum, wheat flour, pea meal, barley meal, etc., followed by astringents, and in cases of great depression by stimulants.

ARSENIC.—The now very general use of arsenic internally and externally, both as a destructive and curative agent, is more than a sufficient reason for its discussion in this chapter. Although arsenious acid is a valuable alterative, tonic, antiseptic, and caustic, it is when used incautiously a very deadly irritant poison. As an effectual parasitic agent, it has long been a popular ingredient in sheep-dipping mixtures, and properly employed it is of undoubted value; but unfortunately, through carelessness and disregard to instructions, serious and fatal consequences have frequently occurred. In like manner its internal use has been abused, from criminal motives, and through carelessness and ignorance.

"It causes irritation, inflammation, and sloughing of any part with which it comes in contact; is readily absorbed; produces, while it remains in the system, loss of appetite, emaciation, various nervous disorders, and depression of the circulation; it appears to

be excreted from the various mucous surfaces, but especially from that of the alimentary canal, producing as it passes through them violent and often fatal inflammation. It exerts its poisonous action with nearly equal certainty by whatever channel it enters the body. All its compounds are poisonous; and, as usual with other poisons, the most soluble are the most active. Arseniuretted hydrogen is probably the most deadly of all its compounds, having occasioned the death of the three chemists who were so unfortunate as to inhale small quantities of it. Orfila found that the sulphurets, in doses of forty to seventy grains, destroyed dogs in from two to six days, and had much the same effect whether they were given in the usual way or applied to a wound. Metallic arsenic, although itself innocuous, unites so readily with hydrogen, oxygen, and salt radicals, that it speedily acquires a poisonous activity."—*Dun.*

"It is now generally admitted that arsenic produces in the living body two classes of phenomena—or that, like the narcotico-acrids, it has a twofold action. One action is purely irritant, by virtue of which it induces inflammation in the alimentary canal and elsewhere. The other, although it seldom occasions symptoms of narcotism properly so-called, yet obviously consists in a disorder of parts or organs remote from the seat of its application.

"It is also the general opinion of toxicologists, that arsenic occasions death more frequently through means of its remote effects than in consequence of the local inflammation it excites. In some cases indeed no symptoms of inflammation occur at all; and in many, although inflammation is obviously produced, death takes place long before it has had time to cause material organic injury."—*Christison.*

Post-mortem Appearances.—Those generally observed after the fatal administration of arsenic, particularly in prolonged cases, are inflammation of the stomach and intestines, notably the villous portion of the former, which is considerably thickened, softened, reddened, and marked with patches of extravasated blood. A brilliant yellowness of the mucous membrane, owing to the formation of the sulphuret of arsenic, is noted by Christison. In aggravated cases, ulceration is present with extensive effusion of lymph. The rectum is usually highly inflamed, and the same condition is observable in the colon and cæcum. The lungs, liver, and spleen

are congested, and the mucous membrane of the urino-genital organs is red and vascular.

"The situations where arsenic is met with in largest quantity are the liver, the spleen, and the urine, but above all the liver."—*Christison*.

On opening the body of an animal poisoned with arsenic, large quantities of foetid gas are usually evolved. Another peculiarity belonging to this poison is the non-decomposition of the carcase, which, on the contrary, becomes dry and mummified, the cellular tissue, brain, lungs, becoming greasy and tallow-like, and the mucous membranes tenacious.

Antidotes.—Freshly made moist hydrated peroxide of iron; magnesia; cold affusions, inhalation of ammonia. If constipated, oleaginous laxatives and clysters.

A remarkable form of arsenical poisoning is that known as the "Copper-smoke Disease," arising from the finely distributed arsenic, or the evolving of arsenious acid, from the copper-smelting furnaces.

"Young animals are most susceptible of this influence; and among the most marked effects are a disposition to ophthalmia, which in general quickly terminates in cataract, enlargement of the knee and hock-joints, and periosteal exostosis of the bones of the extremities. The first indications of animals being thus affected are dulness and refusal of food. On examination the teeth will be found incrustated with a bluish concretion, the gums humid and red, and the saliva secreted in increased quantities, symptoms analogous to ptyalism."—*Morton*.

COPPER, IRON, AND ZINC are each irritant poisons when given in excess.

Copper in large quantities especially causes indigestion, impaired appetite, and inflammation of the stomach and intestines. From its powerful astringent properties it is also liable to produce abortion in pregnant cows.

Antidotes.—Diluents and albuminous substances.

OXALIC ACID.—This in a concentrated form causes violent inflammation of the throat and alimentary tract, extravasations of black blood, with granular or coffee-ground-like fluid in the stomach.

Antidotes.—Magnesia, chalk.

AMMONIA.—The symptoms produced by over-doses of ammonia

are closely allied to those of tetanus, irritation of the spinal cord being apparently its chief action.

Antidotes.—Large draughts of water ; oil, mucilage, and dilute acids.

SAVIN (*Juniperus sabina*).—This plant, commonly believed by the vulgar to possess the property of improving the condition of animals, and in human medicine a decided abortionist, is in excessive doses an irritant poison, producing violent pain, inflammation of the stomach and intestines, associated with purgation ; and in the female, inflammation of the uterus and peritoneum. Medicinally, it is used as a vermifuge, but its action is uncertain. Its power as an abortive agent in the lower animals is unquestionable.

Antidotes.—Large doses of oil, mucilage, and subsequently stimulants. Externally, hot fomentations and counter-irritation.

CANTHARIDES.—In the powder, tincture, acetic solution, or oil, is an active irritant poison. In large doses it causes intense gastro-enteritis, inflammation of the bladder, coma, convulsions, and death. Abortion has followed its use both externally and internally. It has gained some popularity in promoting venereal appetite.

Antidotes.—Mucilage per mouth and rectum, demulcent injections into the bladder. In extreme pain and inflammation, opiates and blood-letting.

CROTON.—The oil or bran, especially the former, when given in excess and unblended with oil or other soluble agents, is an irritant poison. It produces violent inflammation of the alimentary canal, especially the stomach and small intestines, with attachment of the mucous membrane and superpurgation.

Antidotes.—Large doses of oil, mucilage, starch, and subsequently astringents.

HELLEBORE (*Helleborus niger*, or Christmas Rose).—This in large doses is an irritant poison, producing gastro-intestinal inflammation, paralysis of the hind-limbs, giddiness, and attempts to vomit. The same results have followed its application to a wound.

Antidotes.—Anodynes and demulcents. Externally abdominal and spinal counter-irritation.

HELMLOCK.—Though rarely producing fatal effects in ruminants,

yet instances have occurred of such results when eaten in large quantities. Its action is narcotico-irritant, causing general paralysis and death by asphyxia.

Antidotes.—Stimulants and oleaginous aperients.

HEMLOCK DROPWORT.—"It is said to be liable to be confounded with common hemlock, or *Conium maculatum*, a mistake which can only happen in very ignorant hands. It has smooth, dark green leaves, more fleshy, and much less minutely divided, than those of hemlock; it presents a purplish appearance at the joints only of the stem, and no diffused purple spots; its fruit is oblong and black, not round, rough, and light brown; and its root, instead of being single, long, tapering, and little branched, consists of from two to ten tubers, like fingers, which are white, and terminate in a few rootlets. These tubers are formed annually in summer from the flowering stem of the season, and send out flowering stems the subsequent year. During the first autumn, winter, and spring they are firm, white, and amylaceous; but in their second summer they become more pulpy, less amylaceous, and greyer. At all times they emit, when broken across, an oleo-resinous juice, which quickly becomes yellow; this juice abounds most when the plant, which is growing at their expense, is about to flower; and it abounds much more at this period in localities in the south of England than in Scotland, especially in the neighbourhood of Edinburgh."—*Christison*.

The resinous matter of the roots, according to M. Comerais, produces in animals dulness, convulsions of the voluntary muscles, a semi-paralytic state of the hind-legs, and sometimes shortness of breath, vomiting, and fluid fecal evacuations.

Antidotes.—Diffusible stimulants.

WATER-HEMLOCK (Fool's Parsley).—This is a narcotic-irritant poison, producing symptoms analogous to hydrocyanic acid. "It is easily known from other umbelliferous species inhabiting watery places by the peculiar structure of its root-stock, which is not fleshy, but hollow, and composed of a number of large cells with transverse plates. From a numerous set of experiments with the root of the cicuta, performed by Wepfer, it appears to cause true tetanic convulsions in frequent paroxysms, and death on the third day. Simon ascertained that the alcoholic extract of the root is very poisonous."—*Christison*.

Antidotes.—Powerful diffusible stimulants.

ASTRINGENT-IRRITANT POISONS.

ACORNS, OAK-SHOOTS, and FERN, when taken in large quantities, act as astringent-irritant poisons.

Antidotes.—Demulcent drinks and oleaginous aperients.

SEDATIVE POISONS.

HYDROCYANIC ACID.—This is the most powerful sedative poison we possess, operating with great rapidity, whether introduced into the stomach, injected into a vein underneath the skin, or absorbed from a serous or mucous membrane. Its fumes are equally poisonous. A few deep inspirations and hurried convulsive expiration are the only symptoms shown after a poisonous dose. In prolonged cases tetanic contraction of the muscles occurs.

"The post-mortem appearances are not very different from those observed in animals dying from natural causes; and any abnormal appearances are much modified by the dose of the poison and the degree of its concentration. There is more or less venous congestion. The blood in all parts of the body is fluid, of a bluish appearance, and evolves the peculiar odour of the acid, which is sometimes also perceptible in the contents of the stomach and in various of the secretions, especially that of the serous cavities."—*Dun.* The odour passes away in time, especially if the body has been exposed to the open air, or a shower of rain. "Emptiness of the arterial system is commonly remarked throughout the whole body."—*Christison.* In some cases the voluntary muscles and those of the intestines are found to have lost their contractility; there is also an absence of cardiac irritability, and the heart is gorged with dark grumous blood.

"The villous coat of the intestines is sometimes red, shrivelled, and easily removed, and the nervous centres are usually congested."—*Dun.*

In plethoric animals there is general venous turgescence, while the heart and great arteries are empty; "the great veins gorged; the spleen gorged, soft, and pultaceous; the veins of the liver gorged; and the kidneys of a deep violet colour, much softened, and their veins gorged with black blood."—*Christison.*

Antidotes.—Fresh air, cold water affusions, particularly to the

head, inhalation of strong ammonia or chlorine. The administration of ammonia, carbonate of potash and hydrated peroxide of iron. The two latter form an insoluble and inert Prussian blue. Bleeding from the jugular is sometimes serviceable. Artificial respiration should be persistently practised until the natural inspiration takes place.

ACONITE (Monkshood, Wolfsbane, Blue Rocket).—This is a powerful general sedative, and in excessive doses a cerebro-spinal poison, paralyzing the nervous functions, and inducing extreme depression of the circulation, notably the heart.

Dr. Fleming recognises two modes of death in animals: first by an overwhelming depression of the nervous system, proving fatal in a few seconds, without arresting the action of the heart; and secondly, by asphyxia, or arrestment of the respiration, the result of paralysis gradually pervading the whole muscular system, respiratory as well as voluntary. Finlay Dun observes: "According to the dose in which it is given, aconite appears to destroy life in one of these three ways: 1st. In very large amount it sometimes kills by communicating a sudden shock, possibly somewhat in the same manner as a blow on the stomach, or a flash of lightning; 2nd. It paralyzes the muscles of respiration; and 3rd. It paralyzes the action of the heart. In most cases, death appears to result from the concurrence of these two latter effects."

Antidotes.—Stimulants internally and externally. Finely powdered charcoal as an absorbent; cathartics. Tannic has been recommended as forming an insoluble compound with the aconite. Nux vomica and strychnia, being directly opposed to aconite in their effects, have been, according to Finlay Dun, successfully employed to rouse the failing action of the heart, and the slow and difficult breathing produced by considerable doses of aconite; and the same authority recommends bleeding to relieve the congestion of the lungs.

DIGITALIS (Purple Foxglove).—The leaf in large doses is an irritant, sedative, and cumulative poison. It acts energetically by whatever channel it enters the body in large doses, producing an accelerated, irregular, and intermittent pulse, tremors, stupor, and coma. It destroys life by direct depression of the heart's action.

Antidotes.—Influents, opium, diffusible stimulants.

COLCHICUM (*Colchicum autumnale*, Meadow-saffron, or Autumn

Crocus).—This is a bulbous plant, plentiful in meadows and pastures in some parts of England. It is a lily-type plant, bearing a pale purple flower, much resembling that of the crocus, the distinguishing feature being that it has six instead of three stamens, and three styles instead of one. The whole plant, flowers, leaves, seeds, and bulb, is very acrid and poisonous. When eaten by cattle it causes violent purgation, with colic and diuresis, depressed pulse, extreme prostration, attempted vomiting, cold extremities, syncope and death.

Antidotes.—Demulcent drinks, and powerful stimulants.

YEW.—The powerful sedative effects of yew are now well known. Its poisonous effects are most active in the young shoots, especially when partially dry; hence the danger of exposing yew-tree clippings within reach of cattle or horses. Several cases of poisoning, and in not a few cases with fatal results, have come under my observation, in horses, cattle, and poultry. The symptoms are drowsiness, sinking pulse, and general depression, with occasionally giddiness and paralysis of the hind-legs.

Antidotes.—The use of the stomach-pump, powerful stimulants and cathartics.

LEAD.—The entrance of this metal, and particularly its soluble compound, into the animal system produces local and general sedative effects, and in excessive quantities becomes corrosive and irritant. Lead-poisoning is not unfrequently met with in cattle kept on pastures in the immediate locality of smelting-works or rifle-butta, while water supplied through leaden pipes or allowed to remain in leaden cisterns has proved equally dangerous. The symptoms depend on the amount of lead accumulated in the system. A capricious appetite is usually observed. Indigestion, due to paralysis of the stomach, colic, constipation, and tympany are frequently present. The coat is rough and staring; the animal becomes excessively lean, tucked up, depressed, and has an unsteady gait. Subsequently the gums become greyish-coloured or blue; sometimes the latter phenomena is presented in the form of a distinct line immediately below the incisor teeth. As the case proceeds, the colicky pains increase, rapid emaciation is an accompaniment, there is general prostration of the nervous system, associated with symptoms of paralysis, epilepsy, or apoplexy, and

finally the animal dies completely paralyzed, often delirious, and almost skeletonized.

"Mr. Cartwright, of Whitchurch, Salop, records in the *Edinburgh Veterinary Review* for August, 1863, three cases of milch-cows poisoned by eating sheet-lead which had been used for lining to chests, and had been carelessly thrown on the manure-heap, and thence been spread on the clover fields. Besides failure of the milk and appetite, grinding of the teeth, and dulness, several curious symptoms are mentioned. The head was rested against the wall as if the animal was asleep, whilst the pupils were nearly closed, and were little sensitive to light or to the movements of the finger. The gait was weak and tottering; whilst for an hour or two at a time the cows, although persistently standing on their hind-limbs, went down on their knees, propping themselves against the wall. The cases survived four or five days. From the fourth stomach of one a pound of the fragments of the sheet-lead was removed; the lining membrane was thickened, and of a brown colour. The mucous membrane, both of the stomachs and bowels, was unnaturally vascular, and exhibited in places patches of ecchymosis. The liver was pale, clay-coloured, compact, and contained little blood. There was nothing amiss with the urinary organs."—*Ibid.*

In the *Chemist* for 1855 Mr. Herapath records some interesting cases of lead-poisoning, which followed the erection of the smelting-furnaces on the Mendip Hills, in 1853. The injury commenced half a mile from the chimney, and extended another half-mile. Oxide, carbonate, and sulphate of lead were found on the herbage, hedges, and hay. On the live stock "the effects of the metal were a stunted growth; a leanness; shortness of breathing; paralysis of the extremities, particularly the hinder ones; the flexor-muscles of the fore-legs affected, so that they stood upon their toes; swelling of the knees; but no constipation or colic, as in the human species: in a few months death followed. If the injured beasts were removed to another farm they never throve. In the young the symptoms were more conspicuous, and the mortality greater. Lambs were yeaned paralytic; when three weeks old they could not stand, although they made great efforts to do so; in attempting to feed them from a bottle, they were nearly suffocated from paralysis of the glottis; twenty-one died early, out of twenty-three. Colts also died, and those that lived could not be trotted

150 yards without distressed breathing. Pigs confined to the sty were not injured, but if allowed to roam were soon affected. The milk of cows and sheep was reduced in quality and quantity, and cheese made from the former had less fat in it; I found in the milk of both minute traces of lead."

SUGAR OF LEAD (*Plumbi acetate*) is similar in its action to the effects already described. "Prinz observed that doses of half an ounce daily, continued for three days, produced in cows feverishness, with a quick, throbbing pulse, colic, and other symptoms of abdominal pain; in one case mania, but in none death. Mecke found that eight ounces dissolved in water, and given in divided doses during two days, destroyed nine cattle; the first on the second, and the last on the fourteenth day after the poison had been given. Early in 1857, a farmer near Glasgow lost eight cows from their boiled food having been prepared in a large tub which had been obtained from a chemical manufactory, and was impregnated with sugar of lead. The symptoms were similar to those above recorded."—*Dun.*

Antidotes.—Sulphuric acid converts lead into an insoluble white sulphate. Sulphuretted hydrogen produces an insoluble black sulphuret. The administration therefore of one or both of these agents is indicated. The sulphates of soda or magnesia and alum, and iodide of potassium have been recommended. Oleaginous aperients should follow the antidotes. Demulcent drinks may also be freely given, and excessive pain is alleviated by opiates. Nutritive food and tonics are eventually required.

NARCOTICS.

OPUM is the inspissated juice of the capsules of the *Papaver somniferum*, the common white or garden poppy. It is a powerful narcotic, producing lethargy, contraction of the pupil, full slow pulse, and insensibility to pain. According to Orfila, it causes in animals hurried pulse, giddiness, palsy of the hind-legs, convulsions of various degrees of intensity, from simple tremors to violent tetanus, and a peculiar slumber, in the midst of which a slight excitement rouses the animal and renews the convulsions. These symptoms are produced in whatever way the poison enters the body, whether by the stomach, or by a wound, or by direct

injection into a vein, or by the rectum. According to M. Charas opium produces three leading effects. It acts on the brain, causing congestion and consequently sopor; on the general nervous centre as an irritant, exciting convulsions; and on the muscles as a direct sedative.

Post-mortem Appearances.—Brain and lungs loaded with dark-coloured fluid blood; stomach and intestines occasionally red; ingesta hard and dry, ecchymoses of the serous membranes. A pervading smell of opium in the tissues and secretions is also invariably present.

With regard to poisoning by the red poppy (*Papaver rhoeas* Gamgee, quoting from Weiss, says: "Grimm observed that cattle having eaten much of the red poppy had a weak, awkward gait, uttered a groan at every step, were affected with diarrhoea, and remained in a stupid sleepy condition. Schnager and Lichte witnessed trembling, foaming at the mouth, loss of consciousness and sensibility, rolling of the eyes, loud bellowing, restlessness amounting even to raving, tympanitis, shivering and twitching movements of the eyes, fixed and widely dilated pupils, agitated pulse; the secretion of milk is stopped. According to Gaultier the secretion of milk was watery, without fat or caseous matter, and diminished in quantity, the pulse small and quick, skin dry, staring coat, grinding of teeth; the animals flew as if rabid on the people that approached them, and bit themselves in the legs. There was constipation, the faeces dry and tinged with blood. As the symptoms of raving and roaring subsided, the animals became dull, stupid, and sleepy; sometimes they lay down, at others they stood, but every now and then the signs of furor supervened. In one case the cattle got loose, ran madly up the village, and struck their heads against the walls and posts. The mad stage lasted for about two hours; the animals fell like dead, but awoke again after several hours. The food taken by these animals was examined by an apothecary, who found it to consist of about three-fourths of the corn poppy, ripe and unripe seed-capsules; *Adonis autumnalis* (pheasant's eye); delphinium (larkspur), and the remaining fourth was clover."

Antidotes.—Powerful stimulants, ammonia or strong acetic acid to the nostrils, cold water dashed on the body, and endeavour to prevent coma by moving the animal about. The abstraction

of blood from the jugular vein has been recommended to relieve congestion of the lungs. Subsequently administer cathartics.

TOBACCO is a narcotico-acrid poison. It depresses the circulation, exerting especially a direct action on the heart, which in excessive doses it paralyzes. When injected into a vein, it causes an accelerated pulse, which ultimately becomes weak and quivering; transient excitement, followed by giddiness; and according to Dun, considerable irritation, loss of appetite, and in all cases increased activity both of the bowels and kidneys.

"Two ounces of powdered tobacco, in a pound and a half of water, were given in divided doses, but within two hours and a half, to a healthy middle-aged cow, and produced heightened temperature of the skin, acceleration of the pulse from 65 to 70, quickened but somewhat oppressed breathing, coldness of the horns, ears, and extremities, dilatation of the pupil, and copious perspiration, continuing all night. Next day the animal continued dull, but on the third day she was perfectly well. An ox, after consuming about four pounds of tobacco leaves, speedily became very restless, ground his teeth and groaned, lay with outstretched limbs and distended rumen, passed quantities of thin, fetid fæces, and died in eleven hours in convulsions. Quantities of the leaves were found in the alimentary canal; and the mucous membrane, especially of the fourth stomach, was red and corroded, particularly where in contact with the tobacco. Hertwig further mentions that goats are similarly affected by doses of one or two ounces, and generally die in about ten hours.

"Tobacco resembles digitalis in many of its actions, but has more effect in increasing secretion. Though nearly allied to the other *solanaceæ* (belladonna, hyoscyamus, and stramonium), it differs from these in causing contraction, instead of dilatation, of the pupils. Though resembling opium in its contracting the pupil and relaxing muscular fibre, it is distinguished from it, inasmuch as it induces more prominently the early symptoms of intoxication, acts less on the brain and more on the heart, and increases the secretions as well of the skin as of all other parts."—*Dun*.

Antidotes.—Stimulants, inhalations, ammonia, affusions of cold water, galvanism, artificial respiration.

HYOSCYAMUS, or Henbane, grows wild in most parts of England, and in certain districts is cultivated for its medicinal properties;

its leaves, which are sinuated, clammy, and hairy, possess the chief narcotic power of the plant. Its root is white, and sometimes resembles the parsnip, for which it has been mistaken.

It closely resembles belladonna in its general action; but as a narcotic, according to Christison, it bears an unequalled resemblance to opium. He further states, "According to the experiments of Professor Orfila, the juice or extract procured from the leaves, stems, and especially the root, produces in animals a state of sleep much purer than that caused by opium. It is most active when injected into the jugular vein, less so when applied to the cellular tissue, and still less when introduced into the stomach. Except occasional paralysis of the heart, indicated by florid blood in the left cavities, no morbid appearance is to be found in the dead body."

Antidotes.—Same as for opium.

BELLADONNA (Deadly Nightshade).—This narcotico-irritant poison grows wild in most parts of England. By whatever channel it enters the system, it causes dilatation of the pupil. A poisonous dose produces an accelerated, hard, and scarcely perceptible pulse, hurried respiration, stupor, and delirium. Hertwig, quoted by Dun, considers that belladonna is rather more active in cattle than horses; and records that doses of the root varying from two to four ounces caused in cows violent symptoms, lasting forty-eight hours, and that larger doses were dangerous.

"In animals poisoned by belladonna, death results partly from paralysis, partly from coma; the blood remains fluid, and putrefaction sets in very early; the lungs, and sometimes also the brain and its membranes, are congested; but no inflammatory appearances can in general be detected."—*Dun*.

Antidotes.—Purgatives; subsequently opium to counteract the effects of the belladonna; stimulants; inhalation of ammonia; galvanism; affusions of cold water to head and chest; artificial respiration; movement.

CAMPHOR in excessive doses is a narcotic and irritant poison. According to Dun it is somewhat irregular in its poisonous action, and he says: "When given in the form of coarse powder it acts chiefly topically, causing inflammation and ulceration of the alimentary canal; but when finely powdered, or in solution, it is absorbed, inducing derangement and depression of the nervous centres, with symptoms of giddiness, delirium, convulsions, and

stupor." A camphoraceous odour is also present in the breath, and after death is found to pervade the organs generally.

Antidotes.—Demulcent drinks, and subsequently aperients and stimulants.

LABURNUM.—The seeds of this tree are poisonous to cattle, their action being narcotic and irritant. Giddiness, foaming at the mouth, staring eyes, paralysis of the hind-limbs, laborious breathing, and feeble pulse, are some of the prominent symptoms noted in the ox. A post-mortem examination reveals more or less inflammation of the alimentary canal, and, according to Dobson, an accumulation of food as a dense mass in the rumen.

Antidotes.—Demulcents; oleaginous purgatives; stimulants.

CHLOROFORM.—This, whether inhaled or swallowed, is a powerful narcotic when received in excess.

Antidotes.—Fresh air; cold water affusions to head and chest; artificial respiration.

STRYCHNIA and *NUX VOMICA* belong to the class of narcotic-acrid poisons. Whether administered in the form of strychnine, nux vomica, or Ignatius bean, it exerts a powerful stimulating effect on the spinal cord and the nerves arising from it.

"Poisonous doses produce in all animals trembling, twitching of the voluntary muscles, and violent tetanic spasms, which gradually become more frequent and severe, and from their involving the glottis, diaphragm, and muscles of respiration, cause death, usually by asphyxia, occasionally by exhausting the irritability of the heart. The symptoms and mode of death are much the same as in tetanus, from which, however, this variety of poisoning may be readily distinguished by the sudden development of the symptoms, their intermittence, and their rapidly-fatal termination. The post-mortem appearances vary somewhat with the severity and duration of the case, and usually include general venous congestion; engorgement of the lungs, right side of the heart, membranes of the brain, and spinal cord; softening of the cerebellum and spinal cord; and, when the patient has survived for some time, redness and inflammation of the intestines. The voluntary muscles are generally soft and flaccid, but the involuntary are usually hard and rigid as before death. Where the spasms have been severe and rapidly fatal, the left side of the heart is firmly contracted, and contains little if any blood."

Antidotes.—Decoction of tobacco, iodine, tannic acid.

CHAPTER XXVI.

DISEASED MEAT—INSPECTION OF MEAT—MILK.

THE conflicting evidence from time to time, has occurred in cases relating to the sale of diseased meat—as to its fitness for food, and the unsatisfactory conclusions that have been drawn therefrom—is one amongst many reasons which induced me to bring the subject forward through the medium of the *Veterinary Journal* in 1875.* And though perhaps not altogether necessary in a work of this description, I have nevertheless ventured to consider it a useful conclusion. In this chapter will be found the same opinions I then expressed, with additional and important matters. In a sanitary point of view, and therefore in the interest of the public at large, it is especially a subject of grave importance. It is also one which affects the veterinary profession generally, relating to those animals which it is the chief business of its members to study.

Mr. Fleming's work on "Veterinary Sanitary Science" has been a grand step in the right direction. He truly observes, "The necessity for recognising the existence and utility of it was never greater than in the present day."

The immense demand for animal food by all classes of society, is perhaps in no country in the world greater than in our own. And when we take into consideration the numerous diseases which are transmitted to man from the lower animals, and especially of the prevalence of tuberculosis—for which England has gained an unenviable notoriety—it is not too much to assert that the subject of "diseased meat" should stand pre-eminently forward.

Dr. Parkes, in his "Hygiene" (p. 186), says: "So great is the influence of food on health, that some writers have reduced hygiene almost to a branch of dietetics. Happiness, as well as health, is

* Reprinted by request in a pamphlet.

considered to be insured or imperilled by a good or improper diet; and high moral considerations are supposed to be involved in the due performance of digestion. If there is some exaggeration in this, there is much truth; and, doubtless, of all the agencies which affect nutrition, this is the most important."

Since the date of my article much has been written concerning the transmission of disease from animals to man, through the digestive system—notably tuberculosis. Yet great and palpable as the danger is, it is an undoubted fact that there is still an enormous traffic in bad meat, and that a great deal of the disgraceful business is done without detection.

From the numerous opinions I have been requested to give on seized meat, and at each examination I continue to make, I am more and more convinced of the necessity of a more rigid system of inspectorship. There is a natural inclination with some people to make the most they can of an animal, whatever its condition may be, and individuals having a thorough knowledge of the danger and disgrace of their nefarious work have feebly attempted to shield themselves under the covering of "sentimentalism," "unnecessary waste," and the like, or by making their higher social position an excuse for their conduct. A newspaper report now and then gives to the outside public but a meagre idea of the amount of trade in diseased flesh which is carried on.

"It is an indubitable fact that cattle, sheep, and pigs are often attacked by maladies which are either very fatal, or the treatment of which is too troublesome or expensive. What becomes of the great majority of these creatures we can only hazard a guess; our inquiries at knackeries and kennels lead us to believe that they are seldom sent there, and report has it that they are very seldom buried. We know that for certain diseases the veterinary surgeon is rarely called in, but instead of him the butcher's services are invoked. It would therefore appear that very many, if not nearly all the hopelessly sick animals of the species mentioned, furnish pabulum for mankind in some form or another."—*Veterinary Journal* (editorial), November, 1878.

The slaughter-houses are the evil centres—especially private ones, and until these are suppressed and the public abattoir substituted, we cannot hope for any great advancement.

As the disputed cases have generally been those of lung-disease,

I will commence with pleuro-pneumonia. Pleuro-pneumonia may be described as a contagious blood-disease, of a subacute form, which comes on insidiously, and often makes considerable progress before it is observed. Hurried breathing, a short dry cough, injected visible mucous membranes, quick pulse, and considerable increase of temperature, denote that inflammatory fever is present in no small degree.

Post-mortem Examination.—The thorax usually contains a quantity of fluid, with bands or masses of fibrine floating in it: the pleural membrane is considerably thickened, and has a fibrinous deposit on its surface, with or without adhesion of the lungs to the walls of the chest; in protracted cases they are generally adherent. The lungs are enlarged, consolidated, and when cut present a peculiar marbled appearance (alone characteristic of this disease). This appearance is due to fibrinous deposit in the connecting areolar tissue of the lobules; and not unfrequently an abscess or two is found. (For full description, see chapter on "Diseases of the Respiratory Organs.")

Keeping this condition of lung in mind, we must now direct our attention to the blood. In Kirke's "Physiology" we read; "The purposes which have been assigned to the blood—those, viz., of conveying oxygen and nutritive materials to the several parts of the body, and of carrying away from them to excretory organs their refuse matters—require that it should be constantly moving through all the parts, and at certain periods should be exposed to the atmosphere, in order that it may imbibe oxygen, and emit carbonic acid and water, the compounds into which the principal refuse matter is converted. To this end, it is provided in man and all warm-blooded animals, that all the blood which has passed once through the several parts of the body shall traverse the lungs and be exposed to the atmosphere before it again takes the same course." In short, in the lungs the blood becomes re-oxygenized and purified.

Can we, then, expect from lungs in the condition I have named as found in pleuro-pneumonia, the blood to undergo properly this change necessary for the well-being of every part of the animal frame? I say, No! But it may be urged, in fact it has been, that there is sufficient lung left healthy to perform the required function.

I must, however, confess my inability to conceive that such a small portion can efficiently do the work of both lungs in a natural state. I further am of opinion that the unhealthy state of one part contaminates the rest.

2ndly. Respiration is arrested, more or less, according to the quantity of lung consolidated. The same physiologist, on the effect of such arrest, says: "When the process of respiration is stopped, either by arresting the respiratory movements, or permitting them to continue in an atmosphere deprived of uncombined oxygen, the circulation of blood through the lungs is retarded, and at length stopped. The immediate effect of such retarded circulation is an obstruction to the exit of blood from the right ventricle; this is followed by delay in the return of venous blood to the heart; and to this succeeds venous congestion of the nervous centres, and all the other organs of the body. In such retardation, also, an unusually small supply of blood is transmitted to the heart; and this small quantity is venous." In other words, we may take it that stale blood is going the round of the circulation, each time gathering more refuse, and with less prospect of carrying it off.

3rdly. We know inflammatory fever is in itself sufficient to change the character of the blood. In such a condition the red corpuscles run together, giving rise to what is termed the *buffy coat*; whilst there is an increase of fibrine and white corpuscles, together with many other changes in the chemical proportions of the blood. We cannot have a better illustration of this effect than vaccination, in which the insertion of the smallest particle of virus, or vaccine lymph, affects the whole blood, creating a general change in its character, and rendering it for a certain period diseased. And as a proof that this change is not momentary, but lasts for a considerable time, we know that re-vaccination, until years have passed away since the first inoculation, often takes no effect. The blood, according to Kirke, once inoculated, retains by the exactness of its assimilation the taint which it first received; though, after a time, it may not have in it one of the particles into which the taint first passed.

Pleuro-pneumonia blood being then undoubtedly diseased, the next question suggested is, How does it affect the flesh? Simply by conveying to it unhealthy materials for its proper support. All

the nutritive elements are derived from the blood; and in order that the process of nourishment may be perfectly accomplished, it is necessary that the blood from which they are derived should be in a fit state and composition. Therefore it is, I maintain, contrary to reason to expect well-nourished, or even healthy, flesh from the condition of blood in pleuro-pneumonia; as this fluid, from being only imperfectly aerated, is not in a fit state to repass through the system. We may as well expect the brook into which continually flows some poisonous stream to go on its course unpolluted, as that flesh deriving its support from poisoned blood will remain healthy.

And now with regard to using such flesh for food. True, instances are recorded in which no ill effects have been known to follow the consumption of pleuro-pneumonia meat. But is this sufficient evidence to sanction its use as an article of diet? Most certainly not. For neither has it yet been proved that human beings may eat with impunity of such food without in some degree, however remote, laying the foundation for disease, or a condition of system that will develop into, or be susceptible to take on, other diseases, for which at the time we are unable to trace any cause.

One reason for apparently no ill effects being known to follow the consumption may be that, fortunately, individuals do not feed daily or continually on such meat. Did they do so, I doubt not some pernicious results would soon be manifest.

Dr. Livingstone stated that the consumption of pleuro-pneumonia meat by the natives in South Africa produced carbuncle and death. It has since been urged (though I have not ascertained on what grounds) that he confounded the disease with anthrax. Be that as it may, as observed by Dr. Parkes, "Altered quality of what is otherwise good food produces a great number of diseases . . . the instances are becoming numerous, and are increasing every day, as attention is directed to the subject. We should conclude," he adds, "from general principles, that as all diseases must affect the composition of flesh, and as the composition of our own bodies is inextricably blended with the composition of the substances we eat, it must be of the greatest importance for health to have those substances as pure as possible. Animal poisons may, indeed, be neutralized or destroyed by the process of cooking and digestion;

but the composition of muscle must exert an influence on the composition of our own nitrogenous tissues, which no preparation or digestion can remove."

I am thankful to say the wholesale traffic in pleuro-pneumonia meat is now greatly modified; that few veterinary inspectors pass it for food, except in the very early stages of the disease, and before any great amount of inflammatory action has been set up. But even the investing of inspectors with this discretionary power is attended with evil, as it allows a loophole for ignorant, non-qualified, or unprincipled functionaries to pass for food that which is totally unfit.

I pass on, next, to the disease commonly known as "Grapes:" viz., phthisis pulmonalis, tuberculosis, scrofula, consumption, etc. The flesh of an animal, the subject of this malady, may be equally condemned with that of pleuro-pneumonia, or more so. Were it a question of choice, the latter is certainly to be preferred.

The "grapy" beast is hereditarily diseased; so that its system has been contaminated throughout life. In all instances the flesh should be destroyed, so far as its sale for human food is concerned. A butcher once observed to me that he could peel these so-called "grapes" off like marbles, and that no one, himself excepted, would be the wiser. Doubtless, ignorant persons might be thus deceived, but the scientific inspector would at once detect that the carcass had been tampered with.

What, again, is usually the condition of the lungs in this disease—the organs in which the blood becomes purified in healthy cattle? Why, so far as broken-down structure, pus, and tubercle are concerned, they are in an infinitely worse state than in pleuro-pneumonia; and not alone are the lungs so diseased—heart, liver, kidneys, intestines, and the whole of the mesenteric glands are involved. To use a common expression, "the animal is filled with bunches of grapes"—in other words, scrofulous or tuberculous deposit. Yet these cattle are frequently in good condition, so far as appearance goes—indeed, fat. But can it be a healthy condition? It is well-known that animals suffering from many diseases (particularly of this type) will make flesh lay on fat (see p. 51), and, unsuspected by the owner, propagate their malady at the same time by contact or in breeding. And so in "grapes" we must bear in mind that, however fat and "beef-like" the carcass looks, scrofulous

blood has been circulating throughout the system of the animal it belonged to, from the earliest period of its being ; and therefore, if used for food, however unpleasant the statement may be, the consumers are eating, to all intents and purposes, scrofulous, tuberculous, blood-poisoned meat, call it what we may. In this disease the blood exercises the same baneful influence on the tissues it nourishes as in pleuro-pneumonia, but with this difference, that it is not uncommon to find tubercle deposited in the muscles which form the meat we eat.

The experiments mentioned in Mr. Fleming's admirable paper on "The Transmissibility of Tuberculosis" ably prove that tubercle may be communicated from one species of animal to another through eating the uncooked flesh in which tuberculous matter is deposited. And with such conclusive evidence of its transmissibility, does it not suggest the probability that tuberculosis in human beings is not entirely traceable to hereditary predisposition, or the usual diseases that tend to produce it? For though thorough cooking may destroy the virulent properties of such flesh, there are unquestionably instances in which meat is not sufficiently cooked to have this effect. This is startling. But how much more so, when we consider that the milk secreted from the blood of such animals forms a daily article of diet for young and old people, and is partaken of usually in its natural state! Here we have still greater cause to think, with dismay, what we may have imbibed innocently in our infancy, or when invalided with a condition of system amenable to its influence! Not unfrequently tubercular deposit exists within the milk-duct, and is conveyed in the act of milking into the vessel whereby its consumption is rendered certain. (See p. 61.)

Mr. Fleming, in the third paragraph of the paper referred to, writes as follows: "The flesh of the ox is consumed as food, and it is essential that it should be in as healthy a state as possible, though the process of cooking might be relied upon, to some extent, to annul any pernicious properties it might have acquired through the animal having been in a diseased condition during life. *Far otherwise is it with the milk derived from the cow.* This seldom undergoes any process which would be likely to destroy whatever injurious qualities it might chance to be endowed with, through the insanitary state of the animal which yields it; and when we

reflect that milk enters largely into the diet of young people—is, indeed, the chief aliment of children and infants, whose bodies it builds up—the question of acquiring disease in this way, and especially such a malady as tuberculosis, becomes one of the gravest moment.”

Again he observes, at the conclusion of his paper: “From what has already been ascertained, there is every reason to view with grave suspicion the use of the flesh of phthisical cattle as food, especially if the disease is much advanced and the tissues generally involved. *But with more reason the milk from cows affected with tuberculosis should be prohibited*, more particularly for the use of infants, who mainly rely upon milk for their sustenance, and whose powers of absorption are very active. Even if this milk did not possess such dangerous infective properties, its deficiency in nitrogenous elements, fat and sugar, and the increased proportion of earthy salts, would alone render it objectionable as an article of diet. It has long been known that it was liable to produce diarrhoea and debility in infants; but though many children fed on such milk have died from general or localized tuberculosis, the part probably played by this fluid in the production of that malady has not been suspected.”

Gerlach, Director of the Berlin Veterinary School, has, from experiments previously made, and again lately, on no fewer than 110 subjects, arrived at the following conclusive facts:

“There is a specific virulent material in tubercular matter; the presence of a tubercular virus is evident. The disease is produced through the digestive canal by tubercular matter. . . . The fibrous tubercles from the serous membranes contain this virus.”*

After speaking of tubercle in other animals, man, and birds, he proceeds to observe:

“The flesh of a tuberculous cow is also infectious, though not nearly so much so as tubercle itself. It requires a much larger quantity of flesh to produce infection than of miliary or cheesy tubercle. Tuberculous matter boiled for a quarter of an hour is still infectious, though to a much less degree than when uncooked. The period of boiling to render it inert depends upon the thickness

* Hence it is abundant in those parts, as on the ribs, which butchers endeavour to dissect away.—J. W. H.

and density of the mass ; in this respect it resembles trichinosed flesh."

Gerlach directs particular attention to the practical fact to be drawn from his experiments, that "*the flesh of tuberculous animals of every kind, and particularly that of tuberculous cattle, should not be consumed by mankind as food.*"

The practical criteria he gives as to the indication of such unfitness are :

1. When there is decided disease of the lymphatic glands.
2. When the tubercles are breaking up and becoming cheesy.

"In the *Italia Medica*, the paper read by Dr. Bizzozzero on the subject of 'Human and Bovine Tuberculosis,' at the International Medical Congress, held at Turin, is published, and in it are the following conclusions: 'Human and bovine tuberculosis have between them the closest anatomical affinity. When the matters of both are inoculated in susceptible animals, they equally give rise to the development of tubercular neoformations, a result which is not produced by inoculation with other substances. It must, therefore, be admitted that their virus is identical, and this shows the necessity for resorting to severe prophylactic measures, in order to prevent the transmission of the disease from animals to man.'"—*Veterinary Journal*, May, 1882.

Ancell observes in his treatise on tuberculosis: "I have seen an infant deprived of its mother's milk because she was of a tuberculous habit, and fed upon the milk of a cow which died of consumption. This child died with tubercles in almost all the internal organs; and the fact, in connection with others of an analogous nature, made so strong an impression on my mind, that I have ever since been suspicious of milk as forming any considerable portion of the diet of consumptive people."

Thus much for pleuro-pneumonia and tuberculosis. I have dwelt on these two diseases particularly, because numerous cattle so affected are butchered in the usual way, and offered for sale without opposition. In fact, the bulk of diseased meat sold proceeds from these two maladies; whilst, on the other hand, animals affected with those next mentioned usually die and are smuggled into the market surreptitiously, and, compared with the former, are few and far between; the carcasses are also, as a rule, destroyed when discovered.

Crocus).—This is a bulbous plant, plentiful in meadows and pastures in some parts of England. It is a lily-type plant, bearing a pale purple flower, much resembling that of the crocus, the distinguishing feature being that it has six instead of three stamens, and three styles instead of one. The whole plant, flowers, leaves, seeds, and bulb, is very acrid and poisonous. When eaten by cattle it causes violent purgation, with colic and diuresis, depressed pulse, extreme prostration, attempted vomiting, cold extremities, syncope and death.

Antidotes.—Demulcent drinks, and powerful stimulants.

Yew.—The powerful sedative effects of yew are now well known. Its poisonous effects are most active in the young shoots, especially when partially dry; hence the danger of exposing yew-tree clippings within reach of cattle or horses. Several cases of poisoning, and in not a few cases with fatal results, have come under my observation, in horses, cattle, and poultry. The symptoms are drowsiness, sinking pulse, and general depression, with occasionally giddiness and paralysis of the hind-legs.

Antidotes.—The use of the stomach-pump, powerful stimulants and cathartics.

LEAD.—The entrance of this metal, and particularly its soluble compound, into the animal system produces local and general sedative effects, and in excessive quantities becomes corrosive and irritant. Lead-poisoning is not unfrequently met with in cattle kept on pastures in the immediate locality of smelting-works or rifle-butts, while water supplied through leaden pipes or allowed to remain in leaden cisterns has proved equally dangerous. The symptoms depend on the amount of lead accumulated in the system. A capricious appetite is usually observed. Indigestion, due to paralysis of the stomach, colic, constipation, and tympany are frequently present. The coat is rough and staring; the animal becomes excessively lean, tucked up, depressed, and has an unsteady gait. Subsequently the gums become greyish-coloured or blue; sometimes the latter phenomena is presented in the form of a distinct line immediately below the incisor teeth. As the case proceeds, the colicky pains increase, rapid emaciation is an accompaniment, there is general prostration of the nervous system, associated with symptoms of paralysis, epilepsy, or apoplexy, and

must remain attached. (2.) The sexually mature *trichina* inhabit the intestinal canal of numerous warm-blooded animals, especially



Fig. 117. Sexually mature *Trichina spiralis*, male.—After Leuckart.

mammalia (also of man), and constantly in great numbers. The duration of its life extends from six to five weeks. (3.) At the second day after their introduction the intestinal *trichinae* attain their full sexual maturity. (4.) The eggs of the female *trichinae* are developed, within the uterus of the mother, into minute filaria-like embryos, which, from the second day, are born without their egg-shells. The number of young in each mother-worm is at least from ten to fifteen thousand. (5.) The new-born young soon after commence their wandering. They penetrate the walls of the intestine, and pass directly through the abdominal cavity into the muscles of their bearers, where, if the conditions are otherwise favourable, they are developed into the form hitherto known. (6.) The directions in which they proceed are in the course of the intermuscular connective tissues. (7.) Only the striped muscle (that of the heart excepted) contains *trichinae*. The majority of the wandering embryos remain in those sheathed muscular groups which are nearest to the cavity of the body, especially in those which are smaller and most supplied with connective tissue. Speaking generally, their number decreases with the distance from the abdomen—being, however, more numerous in the anterior half of the body. (8.) The embryos penetrate into the interior of the separate muscular bundles, and here already, after fourteen days, acquire the size and organization of the well-known *Trichina spiralis*. (9.) Soon after

the intrusion of the parasite the infested muscular fibre loses its original structure, the fibrillar collapse into a finely granular substance, whilst the muscular corpuscle change into oval nucleated cells. (10.) The infected muscular bundle retains its original sheathing up to the time of the complete development of the young *trichinae*; but afterwards the sarcolemma thickens, and begins to shrivel at the extremities. (11.) The spot inhabited by the rolled-up parasites is converted

into a spindle-shaped widening, and within this space, under the thickened sarcolemma, the formation of the well-known lemon-shaped or globular cysts commences by a peripheric hardening and calcification. This degeneration commences several months after the wandering. Immature muscle-*trichinæ* are not capable of



Fig. 148.—Immature Female *Trichina*, from Muscle.—After *Leuckart*.

producing infection. (12.) The migration and development of the embryos also take place after the transportation of the impregnated *trichinæ* into the intestines of a new host. (13.) The further development of the muscle-*trichinæ* into adult animals is altogether independent of the formation of the calcareous shell, and occurs as soon as the former have reached their completion. (14.) Males and females are already recognisable in their larval state. (15.) The immigration of the *trichina*-brood in masses produces very grave or even fatal consequences, such as peritonitis (from the embryos perforating the intestinal walls), pain, and paralysis (resulting from the destruction of the infected muscular fibres). (16.) The infection of man occurs especially through swine. (17.) The muscle-*trichinæ* are so capable of resistance that they are by no means in all cases destroyed by the ordinary methods of roasting, cooking, pickling, and smoking. (18.) As a rule, swine obtain *trichinæ* from rats, to which latter we also, as the natural bearers, have to convey them. Microscopic examina-

tion of flesh is, therefore, urgently recommended as a public preventive against all danger from *trichinæ*."

From the Fifth Report of the Medical Officer to the Privy Council I extract the following case, abbreviated: "A robust maid-servant was admitted into the Dresden Hospital on the 12th January, 1860, having been indisposed since Christmas, with depression, lassitude, loss of appetite, heat, and thirst. Death took place on the 27th. In the post-mortem examination, the muscles were found, on microscopic examination, to harbour vast numbers of non-capsulated *trichinæ*. The parasites were living some coiled in spirals, others with extended bodies; and all as Professor Virchow was the first to show in a fragment of muscle (which was forwarded to him for examination) living within the sarcolemma of the primitive fibrils. They showed various stages of development; they were diffused over all the striated muscles of the body, with the exception of the heart, and that in such vast numbers, that under a small magnifying power as many as twenty were in the field of vision simultaneously. The intestinal mucus was found to be swarming with mature *trichinæ* of both sexes; and the remarkable fact was elicited that female *trichinæ* are viviparous, the central portion of the bodies being observed to be full of well-developed embryos.

"Inquiry as to the source of infection being made, it was ascertained that on December 31st, four days before the patient was taken ill, two pigs and an ox had been slaughtered in the establishment of her master. Some smoked ham and sausage, prepared from the meat of one of the pigs, were fortunately obtained, and on examination proved to be full of *trichinæ*. The butcher of the establishment had also been taken ill shortly afterwards, and confined to his bed for three weeks, which Professor Zenker surmised 'was due to the immigration of *trichinæ*, and their not being sufficiently extensive to prove fatal.'"

Dr. Leuckart states that he has seen a corpse in which half an ounce of flesh contained 300,000 *trichinæ*. "In one of the cats on which Leuckart experimented, he estimated a single ounce of its muscle-flesh to harbour no less than 325,000 *trichinæ*. I find that a relatively similar degree of infection in an ordinary human 'bearer' would yield 30,000,000. In the case of one of my own experimental animals, a pig, I reckoned that there were at least

16,000,000 of *trichinae*. The larvæ were about ten months old, and enclosed within perfectly-formed capsules; nevertheless, the animal had never displayed any symptoms of irritation. In a trichinized human subject examined by Dr. Thudichum, it was estimated that 40,000,000 parasites were present. My own estimate, calculated from specimens of muscle obtained from the same case, gave 100,000,000 as the approximate number of worms present."—Cobbold.

Mr. Gamgee (Fifth Report of the Medical Officer to the Privy Council), in mentioning the way *trichinae* injure, according to Dr. Leuckart, says: "It is very startling to learn that a dangerous and fatal enteritis may be induced by the mere act of piercing through

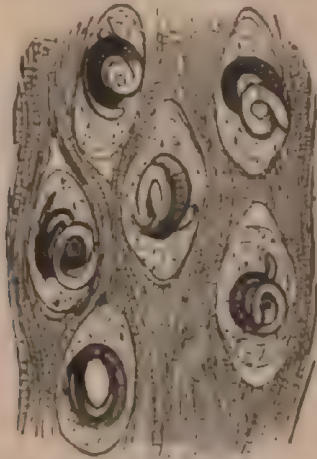


Fig. 149.—Encysted Fleshworms, or Musculo-Trichinae.—Cobbold.

the coats of the intestines, which is the method adopted by *trichinae* to reach our insides, and take up their abode there. Further, that they resist external influences calculated to destroy all other parasites." Leuckart adds: "If in the course of these observations I have chiefly held pork in view, it is because human entozoa are found in their young condition more among pigs than all other animals slaughtered." Mr. Gamgee remarks: "I can state, on my own authority, that less attention, if possible, is paid to diseased pigs slaughtered than any other animals; and I am confident that the more the subject of parasitism is studied,

the more will it be found necessary to have well-trained veterinarians to inspect, wherever slaughtering for human food is carried on."



Fig. 150.—Larval *Trichinæ* coiled within its capsule.—After *Bristowe* and *Rainey*.

As regards ourselves, Dr. Cobbold writes: "As commonly observed in the human body, our young *trichinæ* appear as

spirally-coiled worms in the interior of small globular, oval, or lemon-shaped cysts (Fig. 149), which latter appear as minute specks scarcely visible to the naked eye. These specks resemble little particles of lime, being more or less calcareous, according to the degree of degeneration which their walls have undergone. In shape and general aspect they are not altogether unlike the eggs of certain nematode worms, but their size alone sufficiently distinguishes them. They measure, on an average, $\frac{1}{8}$ " in length by $\frac{1}{16}$ " in breadth."

MEASLES, *Cysticercus cellulosus* (Fig).—The flesh of pigs affected with this disease produces the *Tenia solium*, or tapeworm, in man. Like the former disease, it is due to a parasite, the larva of the tapeworm; therefore, where this worm is present, and pigs

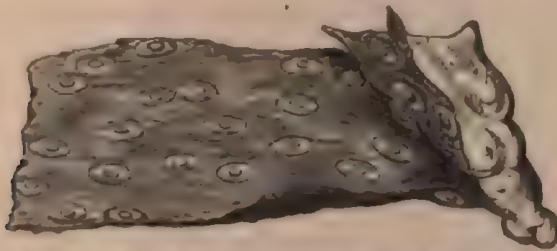


Fig. 151.—Measles or Cysticerci in Pork.—Cobbald.

have access to it, we may look for measles. Mr. Gangee, in the report alluded to, says: "It is certain, however, that those pigs suffer most from measles that live in common with human beings; that are allowed to roam about at will, and to eat human excrement around the cottages, in the roadside, etc. A very few people affected with tapeworm discharge joints enough to contaminate an immense number of pigs. Each tapeworm has an average lifetime of two years. It produces in that time 1,600 joints, and each of these contains 53,000 eggs, making in all 85,000,000. Each egg is capable of developing into a *cysticercus*, but, fortunately, the great majority of the joints of a tapeworm are destroyed. Were they not, every pig would soon be measly, and every man, woman, and child suffer from *Tenia solium*." The flesh, therefore, of pigs infested with measles, though not perhaps attended with the same danger as trichinosis, should, never-

theless, be in all cases condemned. Mr. Gamgee observes that it is quite evident that inspectors of such meat must be helminthologists.

MEASLES (in Cattle).—The *cysticercus* of the ox produces the *Tenia mediocanellata* in man, and though up to the present time no injurious effects (according to medical authority) have been known to be produced in the human species by these bodies, yet, as Dr. Parkes observes, "It is by no means improbable that some effect on man may be hereafter discovered to be produced." From the fact of its creating another form of tapeworm in human beings, its use for food should be prohibited.

In the Fifth Report of the Medical Officer to the Privy Council Mr. Gamgee observes: "Recent researches by Dr. Leuckart demonstrate incontestably that there is a form of tapeworm not unfrequently confounded with *Tenia solium*, which does not originate in man from eating measly pig, but from eating imperfectly cooked veal and beef. In many parts of the world, the hydatid prevails amongst cattle, which develops into *Tenia mediocanellata* in the human intestine. That hydatid is found in many parts of Europe, and probably exists occasionally in this country. Dr. Cobbold has a specimen of *Tenia mediocanellata* in his collection, obtained from Sheffield, and he informs me that we shall probably find that this variety of tapeworm is not at all rare in this country. Leuckart quotes an observation which interests us as Englishmen. He says that Knox observed a tapeworm epidemic during the Kaffir War in 1819, amongst the English soldiers, due to their being fed on unsound beef. Abyssinians are affected with this disease, and observations have been made in Germany and Russia as to the occurrence of *Tenia mediocanellata* amongst children fed 'aus diätetischen Gründen,' or raw beef." (For illustrations and description of this parasite see p. 504.)

TYPHOID FEVER (in Pigs), commonly called the "Purple," the "Soldier," "Apoplexy," etc.—This disease, which lately has prevailed to a great extent in England, is allied to the typhoid fever of the human being, and frequently assumes a malignant type. The amount of enteric disturbance, followed by extravasations of blood underneath the skin, often succeeded by putrid

decomposition, render the flesh unfit for food. The sides, when cured for bacon, frequently show marks of these extravasations or blood-blotches, and these, it is stated, are passed off by bacon-dealers for bruises.

"Rot" (in Sheep), "The Fluke," *Distoma hepaticum*.—This disease, which is due to a parasite in the liver, is found in sheep in all conditions. The flesh, when the animal has been affected some time, becomes poor in quality, pale and moist. Its use as food, and especially when dropsical swellings have supervened, should be interdicted. This parasite produces in the human being the *Echinococcus* disease. It has been rarely observed in England, but is stated to be common in Iceland.

SMALL-POX (in Sheep), *Variola ovina*.—This is an eruptive contagious blood disease. The flesh of sheep affected with it is soft, pale, and moist, has a nauseous smell, and, according to medical authorities, produces sickness, diarrhoea, and low fever. It is unfit for human food.

CANCEROUS DISEASES.—As these are generally of a constitutional taint, accompanied more or less with pyæmia, the flesh should not be used for food.

DISEASES OF THE URINARY AND GENERATIVE ORGANS render the flesh more or less unfit for food. In the former, the tissues become impregnated with the odour of urine, if no worse results follow. In the latter, where there is inflammation of the womb, uterine abscesses, retention of the placenta, or a decomposed fetus, the sickening odour accompanying each of these conditions is likewise communicated to the flesh, and it is not fit for consumption.

INSPECTION OF MEAT.

That the inspection of meat is essentially a veterinarian's duty has been over and over again clearly demonstrated; the egregious blunders made by medical men point to their inaptitude, with but few exceptions, for such a post. Take two illustrations out of many within my own knowledge. In a seizure of mutton from sheep affected with rot, a medical man called for the defence swore that fluke was a blood disease, and further, that he thoroughly understood it. In the other, some privet-leaves in a vial of water were recog-

nised as unusually fine specimens of fluke. Well may butchers laugh in their sleeves, and consumers of animal food quake and hesitate ere they swallow the dubious morsel. Very recently an eminent and well-known surgeon in conversation on this subject observed "We know very little or nothing of animal diseases, and inspection of meat is not our province. If I invited you to attend a post-mortem of a person who had died from, say, some form of liver disease, I should not do it for the sake of your opinion as a veterinary surgeon, but simply to show you an interesting pathological condition." Still, though clearly a veterinarian's duty, it is not my wish, nor do I for a moment intend, to arrogate to our profession the sole competency of being able to decide in disputed meat cases. Firstly, because some medical men are veterinarians; secondly, others are comparative pathologists and men of deep research. It is the latter that honour us, and from whose companionship and interchange of ideas mutual and public benefit accrues. Linked arm-in-arm the two professions learn from each other. And I am individually honoured in counting on my list many eminent, valuable and staunch friends in the medical world. It is those, and unfortunately they are the great majority, who have made no study of animal diseases and comparative anatomy that I object to being placed in the veterinarians' legitimate position.

At the same time, I also feel constrained to observe that men practice without scientific knowledge is not sufficient to pronounce what may or may not be eaten in the way of flesh by human beings with impunity.

Acting with veterinary surgeons, or having undergone a scientific training, meat inspectors might be of immense benefit to society. Without such training or professional assistance their value becomes considerably diminished, inasmuch as there are many diseases connected with those animals they are particularly called on to inspect, which they are totally unacquainted with; and therefore, not knowing the nature of the disease, they are unable to tell the effect it may produce on the flesh, to its detriment as food.

It is said, "a little knowledge is a dangerous thing," but it cannot be denied that in certain cases a little knowledge is a very useful thing. Let it be necessary that an inspector should have a certain amount of knowledge concerning the nature of disease in those

animals it will be his duty to inspect before he is appointed for that purpose, and it will soon be manifest how infinitely better adapted he will be for the post than starting, as many do, ignorant of disease almost in any form, and who take their cue—the only one they have to guide them—from the appearance of the meat.

True, the moist or flabby appearance that meat is often destroyed for, guides, to a certain extent, the inspector in his decision. I say to a certain extent, because it must be borne in mind that thousands of diseased carcasses are offered for sale that never present this appearance at all. Diseased meat will "set" not only moderately, but firm, and seem in many cases well fed, especially in pleuropneumonia and tuberculosis. On the other hand, certain influences will prevent sound healthy meat from "setting," as exposure to wet, close packing, etc. Therefore, although it is right to look upon moist unset meat with suspicion, at the same time an apparently "well-set" piece should not be carelessly passed by.

Before proceeding further, it may be useful and interesting to the general reader to glance at the distinctive characters of horse-flesh as mentioned by Professor Walley. He says:

"The flesh (muscle) of the horse is much darker in colour and coarser in texture than that of the ox; in flavour it is, on the whole, superior, but its odour is by no means so pleasant.

"The fat is always yellow in colour, soft, and possessed of a rather unpleasant, sickly flavour.

"Cases have been known in which meat-contractors have attempted to substitute horse for ox-beef, and while no direct harm could be inflicted by such substitution—providing the animal from whose carcass the beef had been obtained was in good health—seeing that in point of nutritive value, and often in flavour and texture, the flesh of the horse is superior to that of the ox; nevertheless, in a monetary point of view, and in a spirit of fair trading, it is necessary that some simple test should be forthcoming to enable those engaged in the work of inspection to detect the difference between the two. The test, or positive proof, is to be obtained in the bones. The bones of the horse are relatively much larger than those of the ox; contain more semi-fluid fatty matter; their processes (both epiphyses and apophyses) are better developed and more numerous, and the floating bones differ materially in size in the two animals; thus, the ulna or elbow-bone of the ox is

much longer than that of the horse; it articulates in fact with one of the bones of the knee; *vice versa*, the corresponding bone of the hind-leg—the fibula—as also the splint bones of both fore and hind-legs, are usually entirely absent in the ox, and if present are only rudimentary. The ribs of the ox are fewer in number than those of the horse (thirteen as against eighteen), but much broader and flatter.

"The bone of the tongue in the horse is composed of five segments or parts, while in the ox there are nine, and the body is angular in shape, the spur process being very short and conical. The tongue, too, in the ox is pointed at its *extremity*, and its *surface* much rougher than that of the horse; lastly, in the heart of the ox a distinct bone (*os cordis*), which is found with extreme rarity in that of the horse, exists."

Regarding the distinguishing features of sex the same authority says:

"In a medico-legal, as well as in a trading point of view, it is also necessary to distinguish between the carcase of a male (whether castrated or entire) and a female animal. In the bull the textures of the sternum (brisket) are much coarser, harder, and darker in colour than in the ox or the cow; the contour of the arm muscles is more perfect, and they are better developed, but in the ox they become comparatively fine, if castration has been performed for any length of time. In the bull and ox the penis is usually left attached to the left side of the flank, its greater size in the former animal forming a marked contrast with its smaller size in the latter.*

"In the bull and ox there is always a mass of fat in either flank; its shape, in oxen, being regulated by the method of emasculation which has been adopted. If the end of the scrotum has been cut off, the mass of fat will be much more elongated and conical than when a lateral incision has been made into either scrotal sac. Those breeders who desire to see a plump purse always remove the end of the scrotum in castration.

"The masses of fat in the flanks of the cow, when the udder has

* It is only right, however, to mention, that some butchers remove the penis of the bull, on account of its large size, leaving only the (pale) retractor muscle.

been removed, are always irregular, and much smaller than in the flanks of the bull or ox.

"These remarks apply equally to the two sexes in the sheep."



Fig. 152.
Tongue of the Horse.



Fig. 153
Tongue of the Ox.—*Gamgee.*

Regarding the general appearance of healthy meat various standards exist.

Mr. Fleming, in his "Veterinary Sanitary Science," divides meat into three qualities, as follows :

"The first comprises flesh of a bright-red colour, well mixed with white fat, firm and elastic in consistency, and possessing an agreeable odour. The best is obtained from fattened adult oxen, aged from four to eight years, and which have been early castrated. It may be exceptionally obtained from fat cows, not more than six years of age, and especially when they have been 'spayed.'

"Flesh of second quality should still have a good red colour; but it has less fat, and is procured from animals which are of inferior fattening qualities, older than the preceding, and those which have been bred from, or have not been very well cared for.

"The third quality of flesh is generally darker in colour, or it may be paler; it is soft, poor in fat, and watery; after drying for two or three hours, the connective tissue becomes yellowish, instead of remaining of a pearly-white hue. It is obtained from animals too young or too old, and which have been only indifferently fed.

"With young animals the flesh is pale; if the colour is too dark, it may be suspected to have been obtained from a bull or from an over-driven animal."

I agree with Mr. Fleming that meat of this quality should not be sold for food, though, as he observes, custom has tolerated it.

Without any classification, I will take what should be the average appearance and condition of sound good beef. Externally, it should be covered more or less with white fat; an absence of this points to deficient feeding. Occasionally the fat is yellow, according to the description of food the animal has had, or its breed. Alderneys and Guernseys particularly exhibit a yellow hue, which not unfrequently extends to the other tissues; there is also little fat externally in these cattle, but in the region of the kidneys, mesentery, and abdominal muscles, it is usually found in great abundance.

On the other hand, a general yellow colour may be due to organic disease of the liver (jaundice); while, again, long contact after slaughter with the gall bladder will produce circumscribed yellowness, or a similar appearance may result from rupture of that organ and the effusion of gall.

Professor Walley remarks: "In judging of the importance to be attached to yellowness, we should observe, if possible, whether the colour is confined to one, or is common to several animals of the

same lot, and an authoritative opinion should never be given from an examination by artificial light."

The lining membrane of the chest (the pleura) should be smooth, glistening, and free from deposit of any kind. Effusion of lymph, or thickening, denotes, as a rule, lung disease; and though it is the practice of butchers to scrape or dissect this membrane away where it has become affected, there is nearly always to be observed a blush or stained appearance on the ribs and intercostal muscles that cannot be concealed.

The meat or flesh should be elastic and firm to the touch, and when cut ought to present a bright-red appearance; it should yield little or no serum, unless immediately after slaughter. The muscles should present much the same colour throughout, and be moderately intermingled or marbled with fat. In Christmas beef, or that which is highly fed, this fat-veined appearance is often excessive, to the detriment of the meat; inasmuch as where there is a preponderance of fat there is a decrease of muscle, and the relative proportion of albumen (which is essential in food) is consequently low.

Softening of the inter-muscular connective tissue, or infiltrations of fluid or pus, denotes the commencement of putrefaction or disease.

The Marrow.—This, in the hind-limbs, should be of a light red or rosy colour towards the extremities of the bone; paler, and of a solid consistency, in the centre. In the fore-limbs it is of an oilier nature. An absence of marrow, or deficiency in its quantity, shows insufficient feeding; and a dark soft condition of it, disease and putrefaction.

According to Dr. Parkes, the amount of bone in proportion to the whole meat should be twenty per cent.

In a hundred parts of meat, he gives the following proportions of constituents:

	Water.	Albumen.	Fats.	Salts.
Meat of best quality with little fat	74.4	20.5	3.5	1.6
" Common quality	75	15	8.4	1.6
" Very fat	63	14	19	3.7

Moleschott gives the composition of fresh beef (according to Parkes this is the mean of all continental analyses) as follows:—

Water	73.4
Soluble albumen and hæmatin	2.25
Insoluble albuminous substances	15.2
Gelatinous substances	3.3
Fat	2.87
Extractive matters	1.38
Kreatin	0.068
Ash	1.6

With regard to the best age of animals for food, they should neither be too young nor too old. The flesh of animals killed too young is deficient in nutritive elements; whilst that of animals too old loses its tenderness of fibre, and is indigestible. Oxen yield the best meat from four to eight years. Sheep from two to four years. Pigs should be well fed; they are slaughtered at various ages.

In calves and lambs, the condition of the bone, particularly the articulations, will guide one to some extent in determining the age. If unborn, or in early life, they are of a reddish hue; at a later period, of a bluish-white or leaden hue.

The flesh of unborn calves is pale, soft, extremely moist, and deficient in fat.

A *deep purple tint* is said to indicate that the animal has not been slaughtered, but has died with the blood in it (*Lethæal*). This condition is particularly seen in the flesh of animals which have been suffocated or drowned. The muscles in such instances are easily separated from the bones, the meat is unset and moist, and if kept a short time emits a peculiar sappy or faint odour, changes to a greenish hue, becomes still more wet, and quickly decomposes.

"*Circumscribed darkness* in colour may be due to hypostatic congestion from the animal having lain on its side or back for some time after slaughter; it may be also the result of post-mortem staining of hyperæmia, inflammation, or extravasation of blood. *Diffused redness* (dyeing) is seen where meat has been subjected to the action of extreme cold and moisture—as in freezing—in blood-poisoning and in decomposition, and is caused by solution and diffusion of the hæmoglobin.

"A *mahogany hue* is a blending of red and yellow, and is due to imperfect decarbonization of the blood, combined with icterus from absorption of bile pigment; it is characteristic of extensive

disease of the lungs and liver, and is most frequently seen in advanced zymotic pleuro-pneumonia and phthisis. The flesh in this case is usually dry, though the flanks may be moist.

"*Iridescence* on section is seen under a variety of circumstances, as in blood diseases, prolonged fevers, inflammatory affections, and difficult parturition.

A *green hue* is indicative of decomposition or gangrene, and is seen in the abdominal parietes when the viscera have been allowed to remain in the abdomen for some time after death; in this situation it may also be due to diffusion of medicinal agents through the coats of the stomach and intestines."—*Walley*.

MILK.

The universal use alike in health and sickness, and its consumption by old and young, of this article of diet, renders its purity a matter of vital importance. Regarding the inspection of dairies, the same remarks made in reference to the inspection of meat are equally or perhaps more strongly applicable here. It is undoubtedly the veterinary surgeon's province to diagnose disease in the animal from whence the lacteal secretion is derived and sold for human consumption. The sanitary condition of the dairy premises is not the only important question to be determined; the health and vigour of the animals themselves should be ascertained. Unfortunately tuberculosis is a frequent disease in dairy cattle, particularly where prolonged lactation is practised. The danger of consuming milk supplied by cows affected with this malady has already been commented on in that section of this work, and it will here suffice to say in all instances of the existence of tubercle it should be condemned. So also should its use be prohibited whenever constitutional febrile disturbance is present in the animal, be the cause what it may.

Again, milk may become injurious through medicinal treatment of the cow. For instance, when the animal is under a course of aperient medicine her milk will produce intestinal relaxation in the person or child who consumes it. A case illustrative of this fact occurred some years ago in my own practice. The cow in question was having small doses daily of sulphate of magnesia;

soon after being placed under this treatment, the housekeeper was affected with diarrhœa. The remedies prescribed for her failed to check the relaxation; but when in the course of a conversation with her medical attendant I happened to mention my case and treatment, the cause and remedy in the woman was apparent. She had daily partaken of the milk from this cow, and when after this revelation she abstained from it, the diarrhœa simultaneously ceased.

That the milk is peculiarly susceptible to impregnation is commonly demonstrated in feeding with turnips. Again, it is a powerful absorbent, and for that reason should never be allowed to remain in the locality of contaminating influences, enteric and scarlet fever having thus been conveyed.

According to Dr. Parkes: "Milk contains all the four classes of aliment essential to health. Being intended especially for feeding during growth, the proportions of nitrogenous substances and lactose as compared to sugar, are large.

"*Average Composition of Unskimmed Milk.*—A certain proportion between the casein, fat, and sugar must exist.

	Per cent. specific gravity.	
	1030.	1024
Casein	4	3
Fat	3.7	2.5
Lactin	5	3.9
Salts6	.5
Total solids	13.3	9.9
Water	86.7	90.1

"The casein is by some supposed to be a combination of albumen with potash (Hoppe-Seyler).

"In addition to casein, a small quantity of true albumen remains in solution after the casein has been thrown down, and there is also, according to Millon, another albuminoid substance, which he calls lactoprotein. In cow's milk the amount of albumen is said to be 5.25 grammes per litre; the amount of lactoprotein is much smaller, but has not been very precisely determined.

"The amount of salts varies from .5 to .8 per cent., but seldom, if ever, exceeds 1 per cent. This is of importance in the detection of adulteration by salts. In poor milk the salts may be as low as .3 per cent.

"Milk varies in quantity and composition according to—1st, the

age of the cow ; 2nd, the number of pregnancies—less milk being given with the first calf (Hassall) ; 3rd, to the age of the calf, being at first largely mixed with colostrum ; 4th, to the kind of feeding, beet and carrot augmenting the sugar ; 5th, and remarkably, according to the race, some cows giving more fat (as Alderneys), others more casein (as the long-horns). The last portion of the milk given in milking is richest in cream (Hassall).

“The buffalo milk is richer in all the ingredients.

“Taking the total solids of cow’s milk at only 10 per cent. (specific gravity 1026), 1 pint (20 ounces) will contain, in round numbers :

Casein	262 grains.
Fat	217 ”
Lactin	341 ”
Salts	42 ”
<hr/>	
Total	863

or very nearly 2 ounces avoird. of water-free food.

“To give 23 ounces of water-free food (or one day’s allowance for an adult), rather more than 11 pints of milk, of specific gravity 1026, are necessary. For an adult this would be far too much water, and the fat would be in great excess. But for the rapid formation and elimination of the young, the water and fat are essential. It is a question whether, in old age, large quantities of milk might not be a remedy for failures in tissue formation and elimination.”*

ALTERATIONS OF MILK.

“The cream rises in from four to eight hours ; it is hastened by adding warm-water, but its quantity is not increased (Hassall).

“Milk alters on standing ; it absorbs oxygen, and gives off carbonic acid ; placed in contact with a volume of air greater than its own bulk, it absorbs all the oxygen in three or four days” (Hoppe-Seyler).

“The carbonic-acid is formed at the expense of the organic matter (probably casein—Hoppe-Seyler), and bodies richer in

* This was a point debated by Galen, so old is this suggestion. It is still undecided. Some old persons cannot digest milk.

carbon and hydrogen are formed; fat increases in amount, and oxalic acid is said to be formed. . . . Subsequently lactic acid is formed in large quantities from the lactin; the milk becomes turbid and finally casein is deposited. The cream, which had previously risen to the surface, disappears."—*Parkes*.

The milk from diseased cows soon decomposes, notably in phthisical affection of the mammary gland. The physical characters of pure milk are thus tested by Dr. Parkes: "Placed in a narrow glass, the milk should be quite opaque, of full white colour, without deposit, without peculiar smell or taste. When boiled, it should not change in appearance.

"*Reaction*.—Reaction should be slightly acid or neutral, or very feebly alkaline; if strongly alkaline, either the cow is diseased (?) or there is much colostrum, or carbonate of soda has been added.

"*Specific Gravity*.—The specific gravity varies from 1026 to 1035. A very large quantity of cream lowers it, and after the cream is removed, the specific gravity may rise. The average specific gravity of unskimmed milk may be taken as 1030 at 60° Fahr., and the range is nearly 4° above and below the mean."

ADULTERATIONS.

"1. *Water*.—This is extremely common, and is, in fact, generally the only adulteration; it is best detected by specific gravity or evaporation.

"2. *Starch, dextrin, or gum*, to conceal the thinness, and the bluish colour produced by water. Not a common adulteration. Add iodine at once for starch; boil with a drop of acetic acid, and add iodine for dextrin, or add acetate of lead and then ammonia: a white precipitate falls.

"3. *Annatto or turmeric* is added to give colour. Liquor potassæ at once detects turmeric. By boiling the milk, the colouring matter remains in the serum.

"4. *Emulsions of seeds* (hemp or almond), added; this is uncommon. Boil. The albumen of the seeds coagulates; the milk will not mix with tea. Hemp-seed gives an unpleasant odour to the milk (Normandy).

"5. *Chalk*, to neutralize acid, and to give thickness and colour.

Let it stand for deposit; collect and wash deposit, and add acetic acid and water; after effervescence, filter and test with oxalate of ammonium.

"6. *Carbonate of sodium*.—Very difficult of detection, unless the milk be alkaline. Determine the ash, and see if it effervesces; if so, either some carbonate has been added, or if the soda have united with lactic acid, this will be converted into carbonate, and enough lactic acid to give an effervescing ash does not exist in good milk.

"7. Milk is often boiled to preserve it. It may then take up from the vessel lead, copper, or zinc, if these metals are used.

"*Cream* is adulterated or made with carbonate of magnesia, tragacanth, and arrowroot. The microscope detects the latter, and particles of carbonate of magnesia (round) can also be seen, and be found to disappear with a drop of acid. It is also said that yolk of egg is added both to cream and milk."—*Parke*.

EFFECTS OF BAD MILK.

"Professor Mosler has directed attention to the poisonous effects of 'blue milk;' that is to say, milk covered with a layer of blue substance, which is in fact a fungus, either the *Oidium lactis* or *Penicillium*, which seems to have the power, in certain conditions, of causing the appearance in the milk of an aniline-like substance. The existence of this form of fungus was noted by Fuchs as long ago as 1861. Milk of this kind gives rise to gastric irritation (first noted by Strinhof); and, in four cases mentioned by Mosler, it produced severe febrile gastritis.

"Milk which is not blue, but which contains large quantities of *oidium*, appears from Hessling's observations to produce many dyspeptic symptoms, and even cholera-like attacks, as well as possibly to give rise to some aphthous affections of the mouth in children.

"Milk contaminated with pus from an inflamed udder, or an abscess on the udder, will give rise to stomatitis in children, and to aphthæ on the mucous membrane of the lips and gums.

"There has been much discussion whether the milk from foot-and-mouth disease in cows (*eczema epizootica*) can cause affections of the mouth, or give rise in human beings to any disease similar to that of cattle; still, there are some striking cases which seem to me sufficient to prove that disease of the mouth (aphthous ulcera-

tion, general redness, diphtheritic-like coating, swollen tongue) and sometimes, though rarely, an affection of the feet, may occur.* Some positive evidence has been adduced by Professor M'Bride, Gooding, Hislop, Latham, and Briscoe. I have also had cases related to me by two medical friends, which seemed quite clearly cases of the disease. It is, of course, possible that some pus or blood from abscesses on the teat or udder may have got into the milk, but it is unlikely that this should have been overlooked.

"A peculiar disease has several times prevailed in the Western States of America, which is caused by the unboiled (not by the boiled) milk of cows affected with the 'trembles,' which is supposed to be produced by the cows feeding on *Rhus toxicodendron*. In children who get this milk-sickness, there is extreme weakness, vomiting, fall in bodily temperature, swollen and dry tongue, and constipation. Boiling appears to remove the hurtful qualities of the milk."—*Parkes*.

Analytical chemistry has gone far to raising the standard of this valuable commercial article. At the same time it must be taken into consideration that cows are variable in the quality of their milk—that the water in not a few cases pronounced as an adulteration on the part of the purveyor is simply the result of the constitutional condition of the animal yielding the milk. Debility, innutritious and insufficient food, hereditary influence, disease, etc., may each be productive of watery milk. While even in dairies where the best milk-producing diet is allowed, and all the cows are fed alike, wide differences in the quality of the milk will exist. My own experience in keeping milch-cows has over and over again proved this. To the pathologist and physiologist the fact is obvious. Too often the wilful fraud does take place; but nevertheless, in justice to milk-sellers, natural, or rather systemic, causes should be taken into consideration by analysts, and equally so by magistrates.

* A case of the foot being involved is recorded by Mr. Amyot. —*Medical Times and Gazette*, Nov. 4, 1871.

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